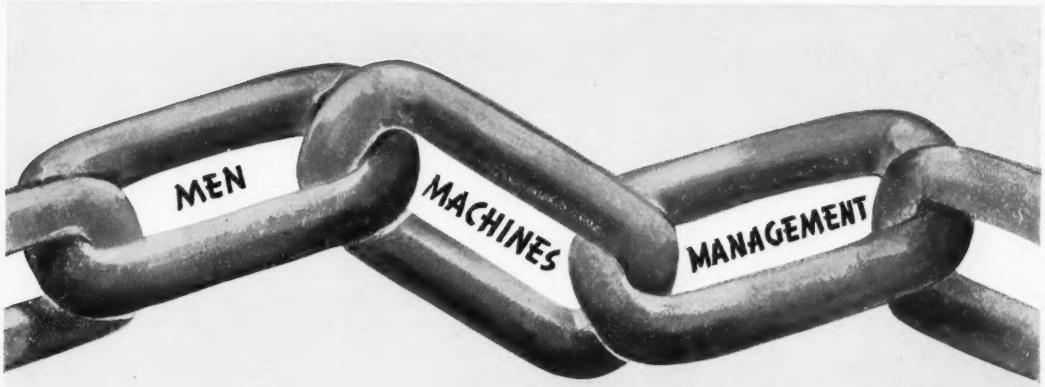
WIRE AND WIRE PRODUCTS

NOVEMBER 1937



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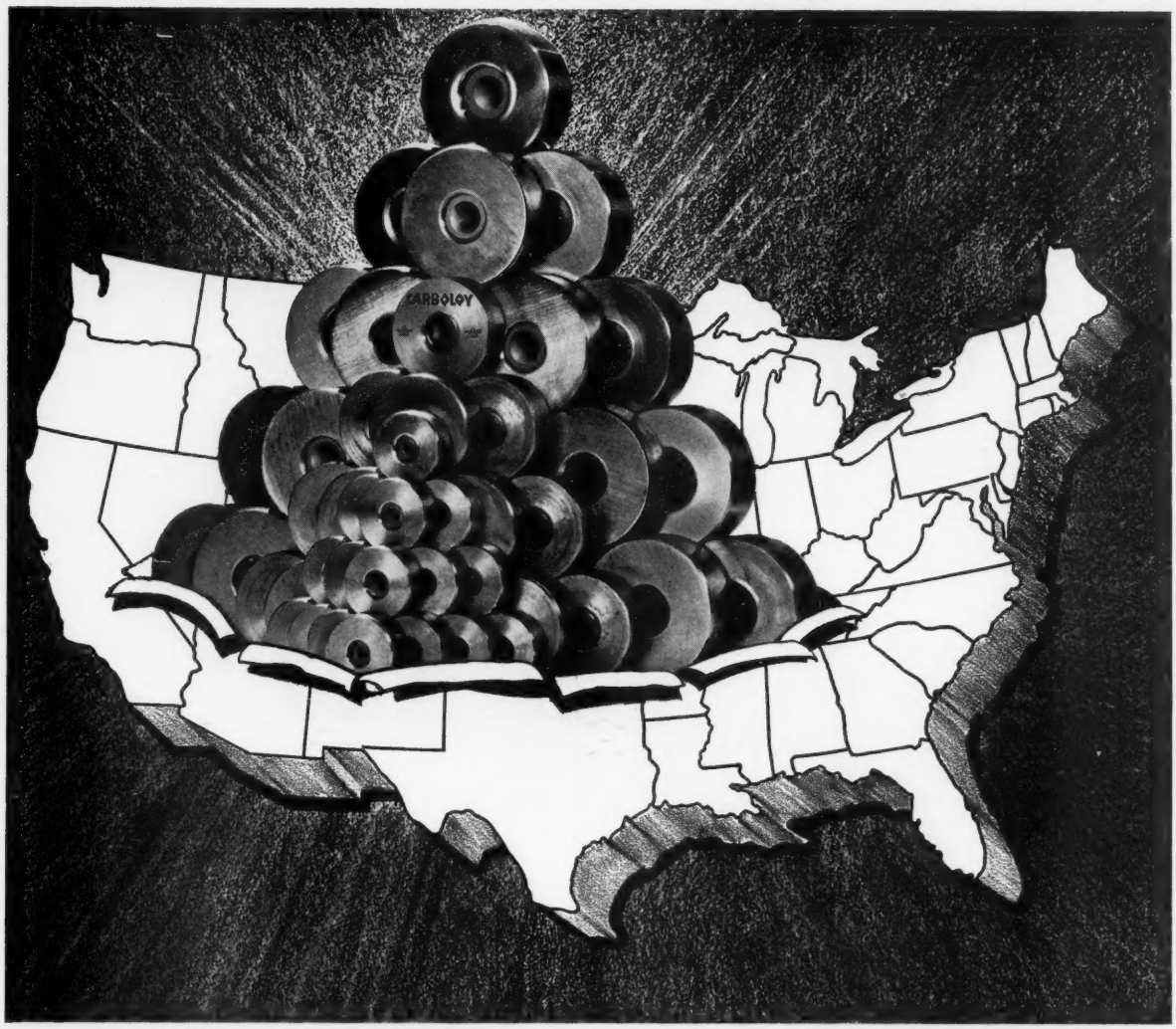

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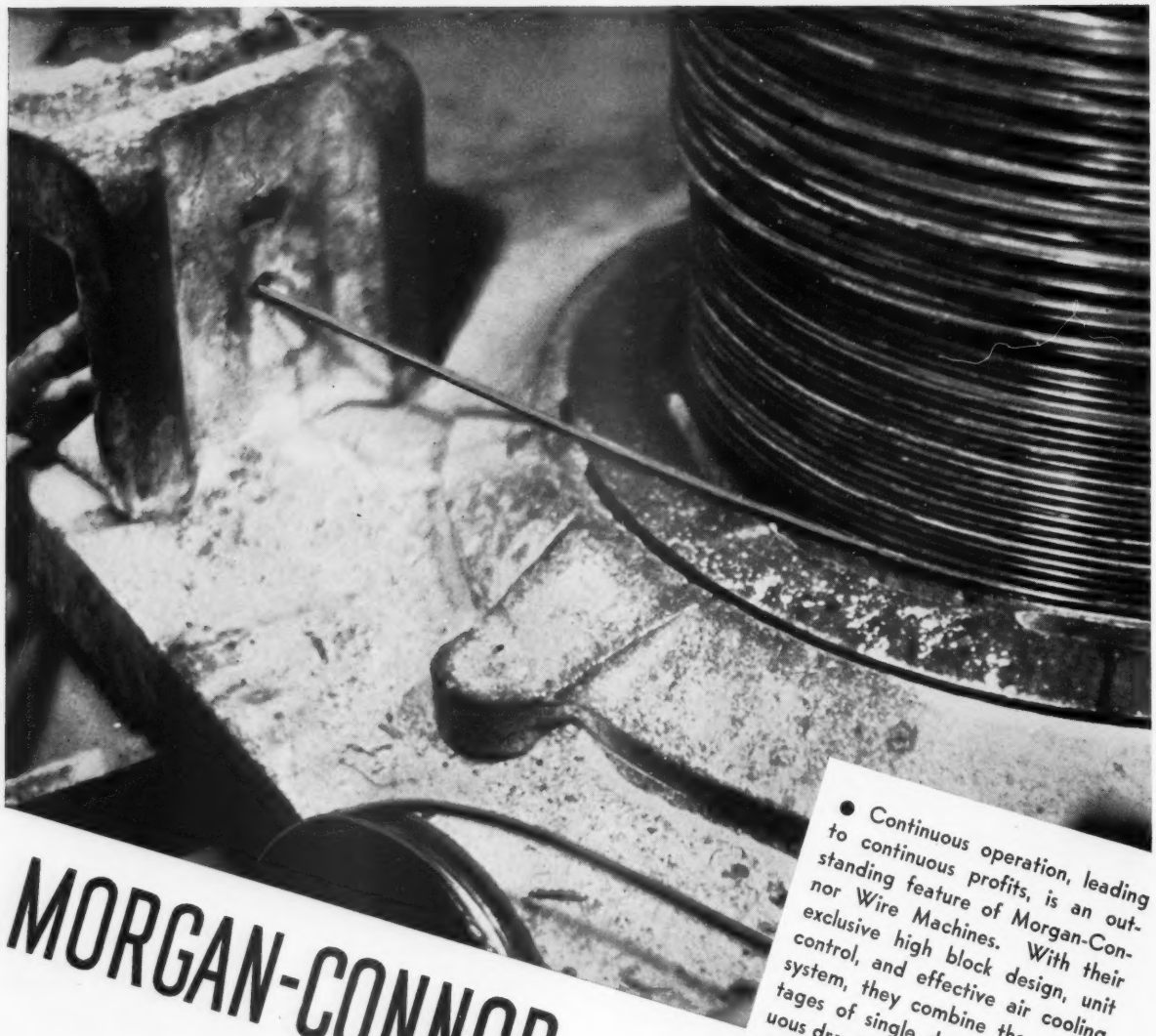
WIRE & WIRE PRODUCTS, Vol. 12, No. 11, November, 1937, Executive office, 17 East 42nd St., New York, N. Y. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.



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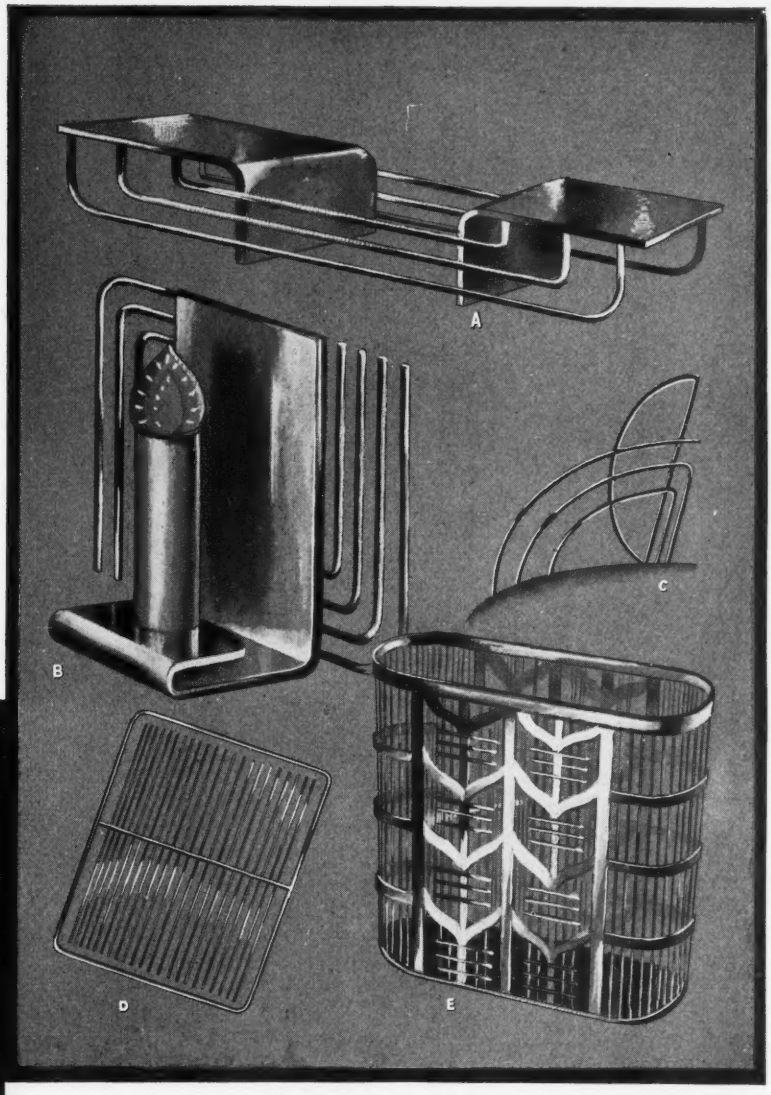

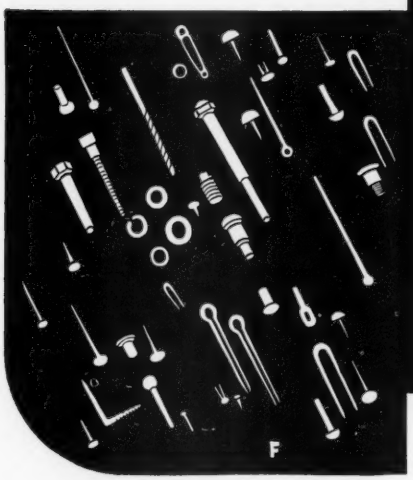

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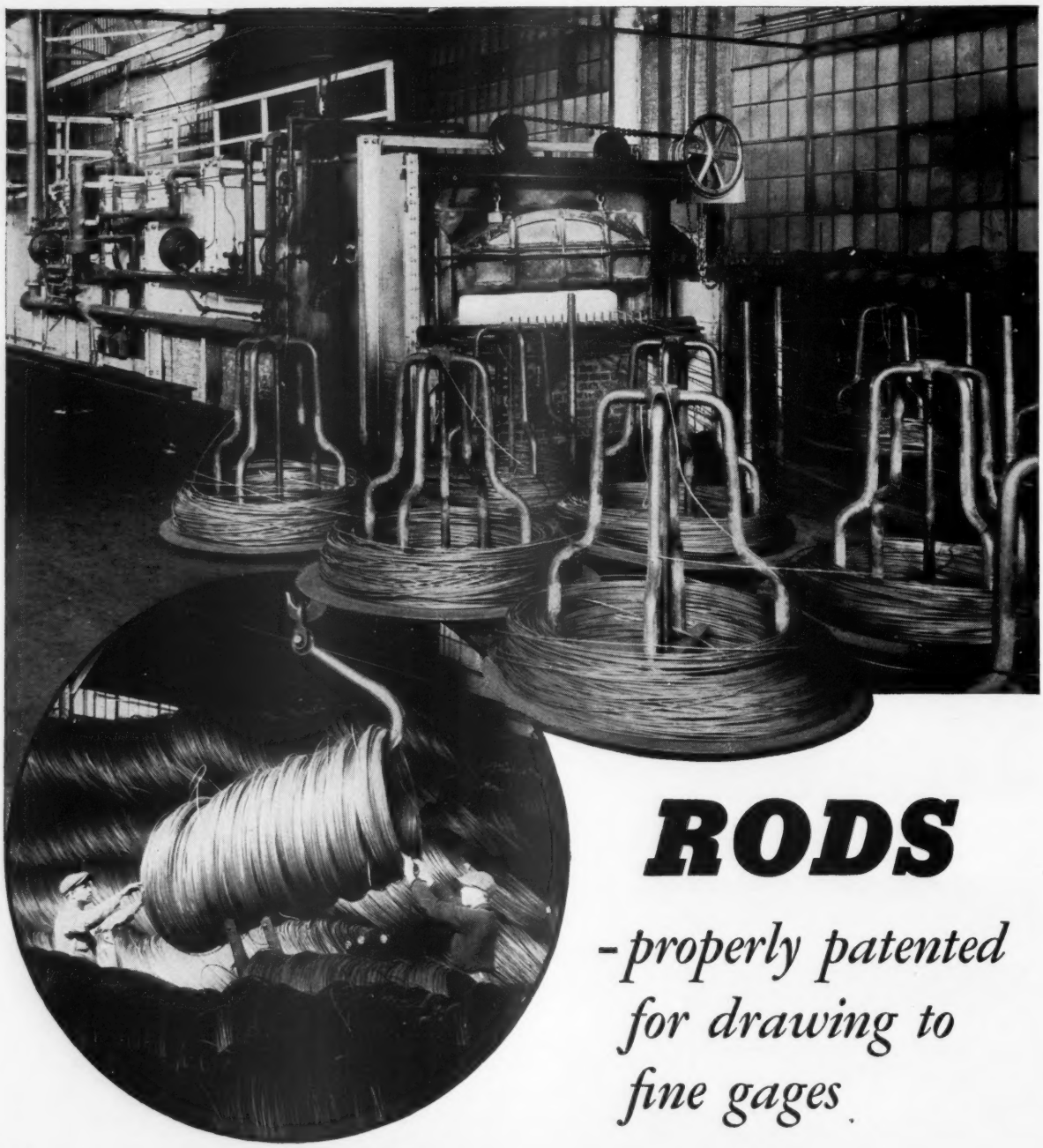

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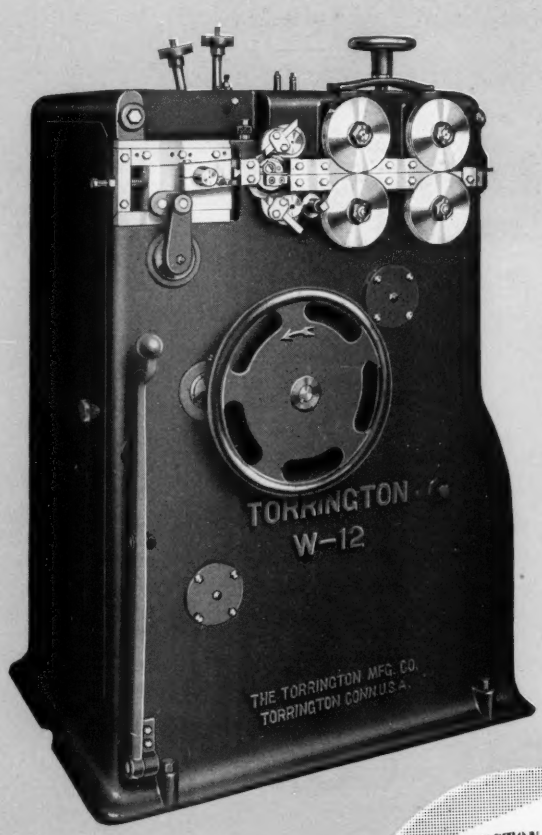

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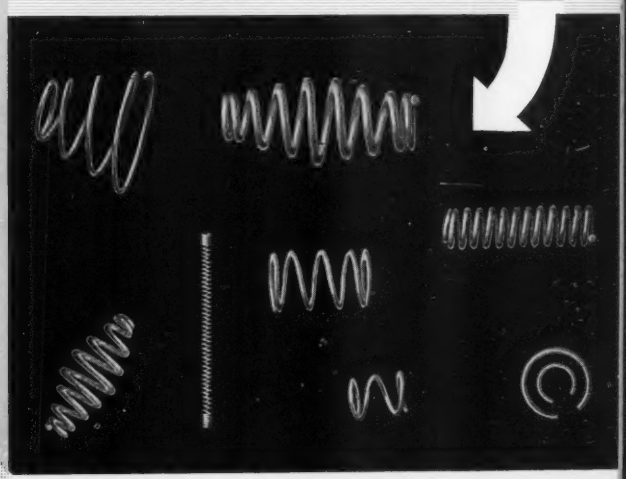

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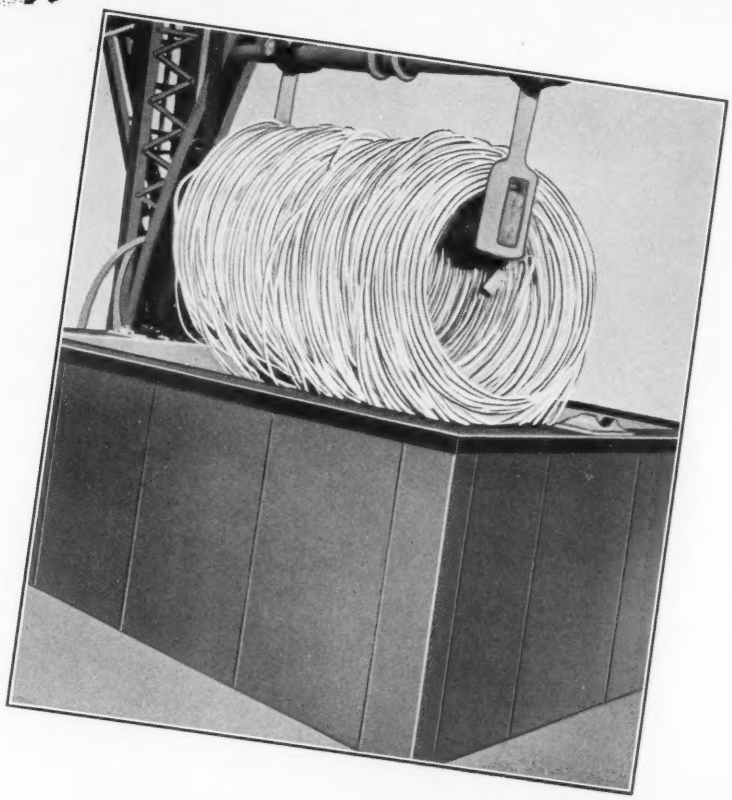
WITH A

MORRISON FLASH BAKER

U. S. Patent No. 1,999,513—Other Patents Pending



OF the many factors combining to produce the speed of Morrison Flash Bakers, an outstanding one is the method of handling coils of rod. Moisture from the lime dip naturally runs down the coils. In conventional rod bakers, these coils are stacked so that the area of greatest compression is the wettest. Drying is obviously difficult and not uniform. By suspending these coils from a cleaning hook during baking, the most open portion is at the bottom; allowing free access of hot air where most drying is needed. This is but one of the many features of the Morrison Flash Baker. Others include fuel economy as low as 75,000 B.T.U. per ton of rod. Speed as fast as six minutes per charge, if needed. Unusually effective baking results. Saving of much valuable floor space. Elimination of steam from the cleaning house atmosphere. Write us for all the details.

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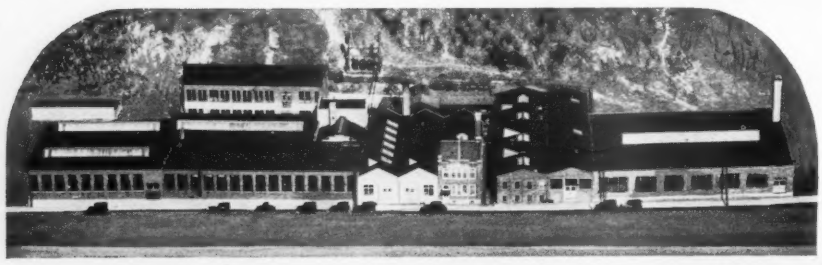

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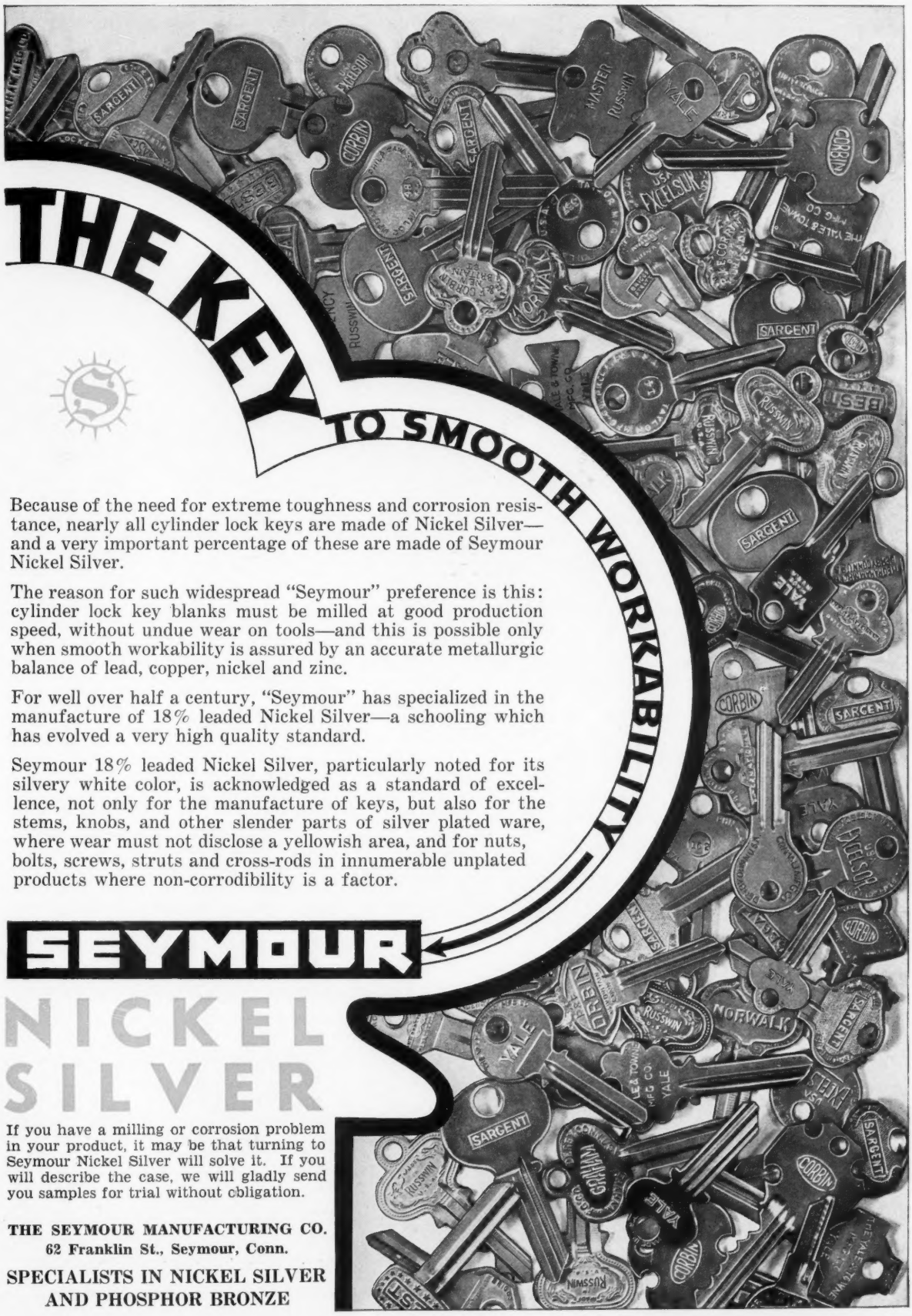

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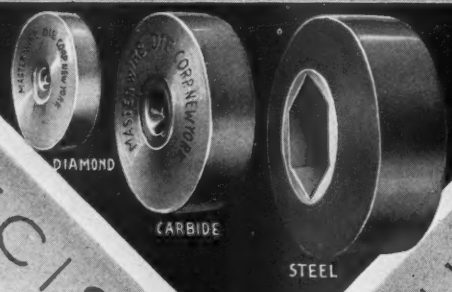

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 12 NOVEMBER, 1937 No. 11

Designated as

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It is important that the wire manufacturer have complete information from the buyer of wire regarding the various operations to which the customer is to subject the wire, in order that the manufacturer can produce a quality of wire with the best balanced combination of those properties. A description of such required characteristics is presented herewith.

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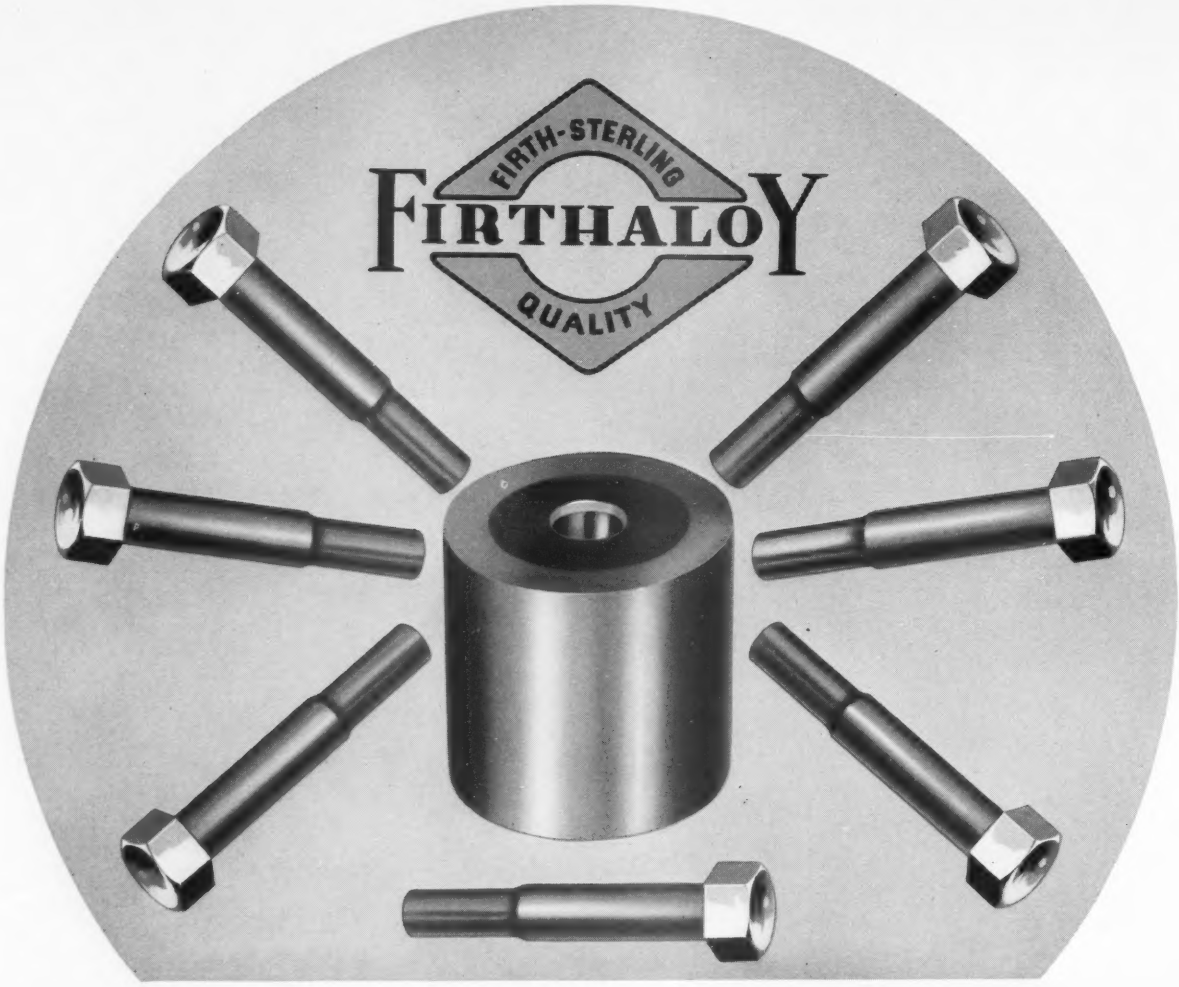

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WIRE AND WIRE PRODUCTS

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Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 12 NOVEMBER, 1937 No. 11

Handling Waste Acids From Pickling Operations*

By H. C. Klein,
Sales Engineer, The B. F. Goodrich Co.,
Akron, Ohio

The purpose of this discussion is to describe some of the recent improvements incorporated in pipe for conveying waste acids from pickling operations. The paper does not deal with the ultimate acid disposal itself but merely with designs of piping used to convey the acids to the place of disposal. Photographs and sketches clearly illustrate the modern changes and designs involved. ✦ ✦ ✦

ONE of the oldest methods used is ordinary vitrified sewer pipe or chemical stoneware pipe. Chemical stoneware pipe, owing to its denser body, more highly selected clays, higher burning temperature, etc., generally conceded by the trade to be a more satisfactory acid conveying medium than is ordinary vitrified pipe. The principal disadvantages of these ceramic pipes are, however, well known to operators confronted with handling spent pickling acids, and in general they are:

1. **Joint leaks.**
2. **Danger of cracking due to sudden temperature changes.**
3. **Easily damaged physically.**

✦ ✦ ✦

DISADVANTAGE No. 1, Joint leaks, has, however, within the last four years been eliminated by the development of the Flexlock rubber pipe joint. These joints are molded rubber rings having internal and external circumferential ribs which grip the bell and spigot of the pipe. (See Fig. No. 1). They assemble easily to form a perfect joint having a number of outstanding advantages:

1. **Positive seal—no joint leaks.**
2. **Flexibility—takes care of expansion and soil stress.**
3. **Installation ease — no other joint can be made so easily.**
4. **Permanence—no joint replacement.**
5. **Low installed cost — cheaper per laid foot than poured type joints.**
6. **Unaffected by most fluids.**
7. **Permits use of bell and spigot pipe on pressure lines—does away with cumbersome and expensive flanged pipe.**

✦ ✦ ✦

THE use of these gaskets permits joint flexibility as its construction is such that slight angularities in a line can be installed without fabricating special angle pieces. (See Fig. No. 2). The joint will also allow for a reasonable amount of settling in the line after installation. These installations, like all other flexible joint lines, must be rigidly supported, but on buried lines the back-fill takes care of this factor.

H. C. KLEIN

Graduate of Purdue University. Class of 1929. Associated with the B. F. Goodrich Company as Sales Engineer, since that date, contacting chemical, rayon and steel plants.

*A paper presented before the Wire Association at Atlantic City, N. J., October, 1937.

Designated as Official Publication by the Wire Association

Fig. 1. The Flexlock Rubber Joint (Courtesy of U. S. Stoneware Co.)

A JOINT of this type is made as follows:

1. Clean all foreign matter from the bell and from the spigot.

2. Push the joint into the pipe bell and smooth out against the bell. (See Fig. No. 3.)

3. Swab the inside of the rubber and the outside of the spigot with Lubriseal. (Lubriseal is a special solution which lubricates the contacting surface of the joints while it is being made and momentarily softens them.) (See Fig. No. 4.)

4. Line the spigot true with the bell.

5. Force the pipe joint together with one continuous movement.

✦ ✦ ✦

ON small sizes of pipe the joints may be assembled by hand (4″ bore and smaller). Under favorable working conditions even 6″ and 8″ I. D. pipe can be coupled by hand. On larger sizes one of three mechanical means of joining are recommended. The entering pipe may be pushed into place by using a crow bar pinched against a wooden cross bar placed at the free end of the entering pipe. (See Fig. No. 5.) The second method is to use a special pipe tool which consists of a toggle frame which shoves the pipe together with a simple level movement. (See Fig. No. 6.) A third method is to force the pipe home with a simple rope sling and jack.

✦ ✦ ✦

WITH ceramic pipe, however, danger of cracking from thermal or mechanical shock cannot be eliminated in all cases. Many pickling operations, particularly continuous strip, present a problem in handling spent pickling liquor hurridly in large quantities. In most instances it is not practical to allow the acid to cool prior to emptying into the sewer. Since the uncooled acid ranges in temperature from 160 to 200 degrees F., it cannot be satisfactorily conveyed through ceramic pipe due to danger of cracking from thermal shock. Such a condition is naturally objectionable because of high maintenance costs and possibility of acid leakage at points where it is apt to cause undermining of building structures.

✦ ✦ ✦

ACID sewer lines are only used intermittently; hence the temperatures of the lines are normal except when acid is being conveyed through them. Ceramic lines will actually handle temperatures well over 200 degrees F. but the temperature must be reached in gradual steps. If the normal temperature is, say, 70 degrees F. a sudden rise to 180 degrees F. will almost certainly cause failure.

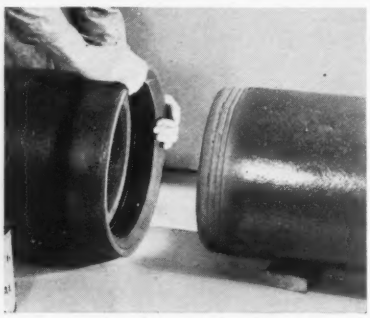

Fig. 3. Inserting Flexlock gasket in bell.

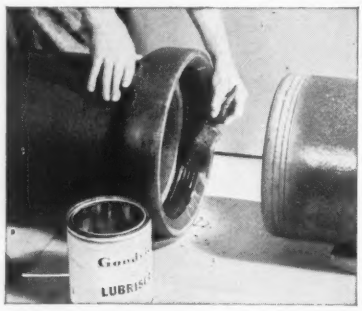

Fig. 4. Applying Lubriseal to inside of gasket.

Fig. 6. Closing joint with yoke-type puller.

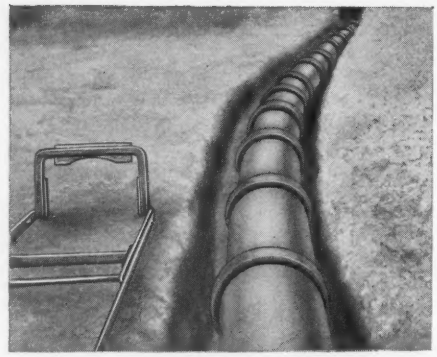

Fig. 2. Taking advantage of Permissible Joint Angularity to make a long sweep bend. (Courtesy of U. S. Stoneware Co.)

Furthermore, with the use of ceramic pipe there is always the danger of its being cracked or broken due to physical abuse.

✦ ✦ ✦

FROM the above we can conclude that ceramic pipe can be satisfactorily used if the temperature variations are not sudden and if it can be suitably protected physically.

✦ ✦ ✦

Fig. 5. Closing joint by use of crowbar and block.

THOSE who have closely followed the development of modern pickling methods during the past five years are well acquainted with the contributions which the rubber industry has made toward increasing the efficiency of this operation. The rubber-lined steel, brick-sheathed pickling tank designs have been widely accepted for rod and wire pickling and for continuous strip. This design for tanks was made possible by

1. The Vulcalock process which permits the bonding of rubber to steel with practically integral adhesion.

2. Triflex—a three ply acid-proof rubber lining, combining the advantages of both hard and soft rubber, equipped with built-in expansion joints.

FIVE years ago the use of rubber linings in the pickling room was considered a daring experiment. Today a check of outstanding pickling installations will show practically a one hundred per cent acceptance of this material as lining for tanks and ventilating equipment in continuous strip and many in rod coil pickling operations.

✦ ✦ ✦

ALTHOUGH the problems of leaking tanks and acid loss have been successfully solved there still remained the important one of acid disposal. Earlier in our discussion we mentioned the need and the reasons for a suitable pipe construction for handling acid waste. The first Triflex rubber - lined acid sewer of any importance and size was installed about three and one-half years ago at the Inland Steel Company to handle the hot waste acid from a continuous strip pickling line. The sewer shell is of welded steel plate construction, made in open top, trough-like sections 20 to 25 feet long. These sections are flanged at the ends and tops, flat covers being bolted on to make the system fume tight. The steel trough and cover sections are lined with rubber, 3/8" thick in this case to prevent diffusion of hot vapor and withstand abrasion of sludge passing through the sewer. (See Fig. 7). At intervals of 100 feet or less rubber expansion joints are installed to compensate for expansion and contraction of the metal shell. Spent acid from the pickling tanks, spray water from fume scrubbers, drainage from drip pans between tanks and overflow from hot and cold rinse tanks are all discharged into this rubber lined sewer.

Fig. 7. Lining 20 ft. sections of steel sewer line with 3/4-inch Triflex for disposal of spent acid from continuous strip pickling tanks. Note Triflex expansion joints.

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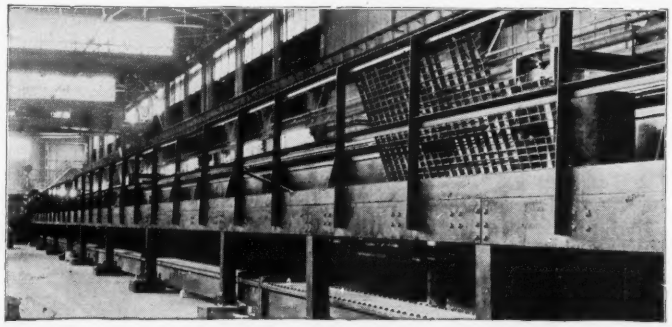

Fig. 8. Continuous Wide Strip Pickling Installation at Inland Steel Company showing Triflex lined steel sewer for disposal of spent acid.

✦ ✦ ✦

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A RECENT examination of this sewer shows it to be in perfect condition. The cloth liner impression on the top layer of rubber is still visible, hence the rubber is 3/8" thick as originally installed. (See Fig. No. 8). A dozen or more lines of practically the same design are now in service and are all performing perfectly.

✦ ✦ ✦

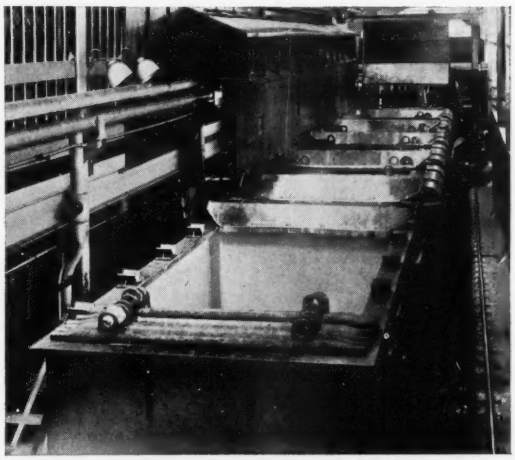

Fig. 9. Battery of Rod Coil Pickling Tanks.

✦ ✦

ONE of the more recent wire rod coil pickling tank installations has been made using a trough type sewer similar to the one just described. This pickling unit consisted of 5 rubber-lined steel, brick-sheathed tanks, assembled for straight line cleaning. (See Fig. No. 9). Lead syphons are used to discharge the acid into the trough type sewer located beneath and to the side of the tanks. (See Fig. No. 10). The complete satisfaction of rubber in the trough type sewer naturally led to its use in various changed designs.

✦ ✦ ✦

ABOUT two years ago another mid-western steel company desired to handle their hot spent acids and fumes, from four 60-ft. acid tanks and two rinse tanks, in a single sewer line. A description of this installaton will be of interest.

✦ ✦ ✦

A UNIQUE combination of flanged steel pipe, rubber and brick, plus a new type rubber expansion joint made possible a sewer construction capable of withstanding the high temperatures, corrosive fluids and fumes encountered in the service.

✦ ✦ ✦

THE sewer located beneath and at one side of the pickling unit comprises three different pipe sizes in order to accommodate a gradually increasing volume of gases and liquid. The pipe line starts at the hot water tank and drains towards the No. 1 acid tank. The pipe at the hot water tank is 17-in. in diameter. At the intake from the cold water tank it increases to 25-in. in diameter. When reaching the No. 4 acid tank, the pipe diameter changes to 36-in. and remains the same for the

rest of the run. The line empties into a large sump which is served by a rubber-lined exhaust fan.

✦ ✦ ✦

ALL pipe is lined with a ¼-in. thickness of Triflex rubber. As a means of protecting the rubber lining from excessive temperatures, the lower inside half of the 36-in. pipe, which carries the hot waste acid discharged from the four pickling tanks, is equipped with a 4-in. sheathing of acidproof brick. Provision for expansion and contraction has been made by mounting the pipe on a series of steel rollers and installing three rubber expansion joints, which are spaced to divide the line into four approximately equal parts. (See Fig. No. 11).

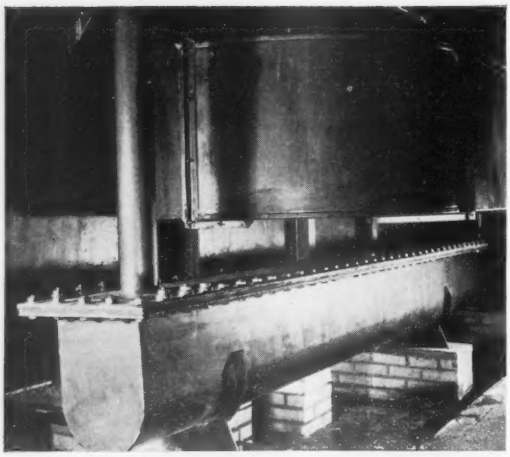

Fig. 10. Lead pipe from rod pickling tank syphon entering rubber-lined trough sewer. ✦ ✦ ✦

✦ ✦ ✦

THESE special expansion joints consist of two flat steel plate rings joined by a 2-in. thickness of soft resilient pure gum rubber which is the sole joining medium between the plate flanges. Each ring is provided with a series of stud bolts in a standard bolt circle to which flanges of the adjoining pipe lengths are attached. The stud bolts do not pass through the rubber slab.

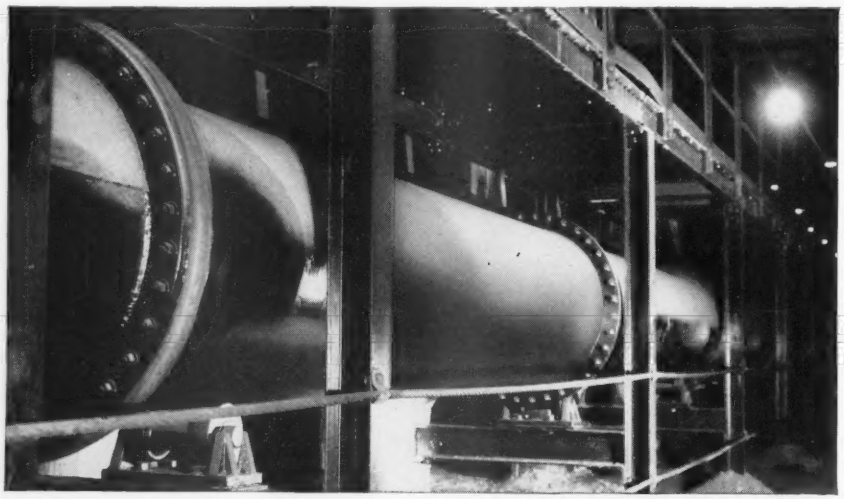

Fig. 11. Section of the acid sewer. At extreme left is shown one of the rubber expansion joints. ✦

✦ ✦ ✦

THE joints are designed to take as much as ½" stretch or compression. Such a construction is only made possible through the development of the Vulcalock process which enables rubber to be attached to metal with almost integral adhesion. (See Fig. No. 12). At those points where the expansion joints are inserted in the 36" pipe it is also necessary to make provision for the expansion and contraction of the brick sheathing. This is accomplished by filling the 2-in. gap in the sheathing with a soft rubber similar to that used in the expansion joint. The fume and acid sewer has shown satisfactory operation and at no time has there been any indications of leakage.

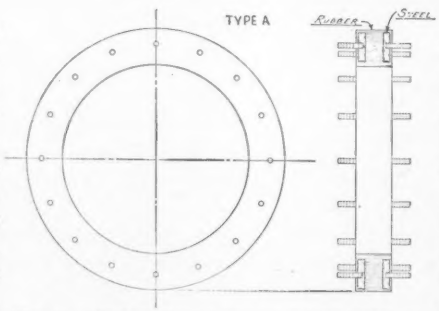

Fig. 12. Cross section of expansion joint which employs soft rubber as sole joining medium. ✦

ABOUT 18 months ago Inland engineers, having had several years of favorable experience with their acid proof rubber-lined trough sewer, set out to replace another waste acid line which was giving them constant trouble. The trough type sewer empties into a collecting sump and acid is led from there through an 18-in. pipe line to a point approximately 650 ft. away for final disposal. For this latter span ceramic pipe was replaced with a new rubber-lined sewer combining the most desirable features of all present developments.

✦ ✦ ✦

THE new sewer consists of approximately 650 ft. of standard 18-in. steel pipe with plain ends. The pipe is lined with rubber which extends out over both ends and is carried back for a short distance on the outside. (See Fig. No. 13).

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THE lengths of pipe are coupled with rubber gaskets and rubber-lined split steel sleeves. The gaskets are the same construction as those described for ceramic-lines.

✦ ✦ ✦

EACH end of the pipe has a gasket snapped over it and the gaskets are compressed to make a seal with the split sleeves. Side rubbers are inserted to furnish the necessary compression at the point where the two halves of the sleeves join. (See Fig. No. 14). The pipe is supported both at front and back of each joint as the gasket is not designed to take a load but merely to act as a seal. After the line was installed it was tested with 20-lb. water pressure and showed absolutely no leakage.

IN addition to resisting the severe thermal conditions of this service and thereby preventing failure due to cracking of the line, this construction offers a number of outstanding advantages. The pipe is easily installed. It is only necessary to snap the gaskets over the ends, place the pipe lengths in their respective positions and bolt the split sleeve over the two pipe ends. (See Figs. 15 to 19 Incl.) After the pipe was strung along the ditch, approximately 300 ft. of the 18-in. sewer line was laid in less than four hours.

✦ ✦ ✦

THE use of these gaskets permits joint flexibility as its construction is such that slight angularities in a line can be installed without fabricating special angle pieces. The joint will allow also for a reasonable amount of settling in the line after installation.

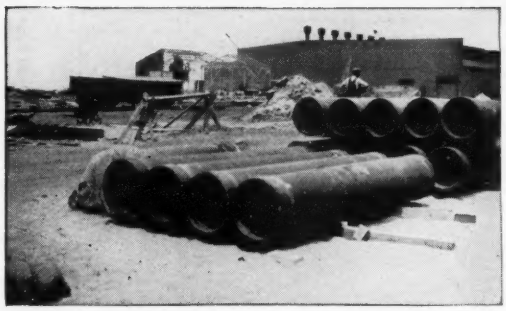

Fig. 13. Triflex lined straight end pipe awaiting installation.

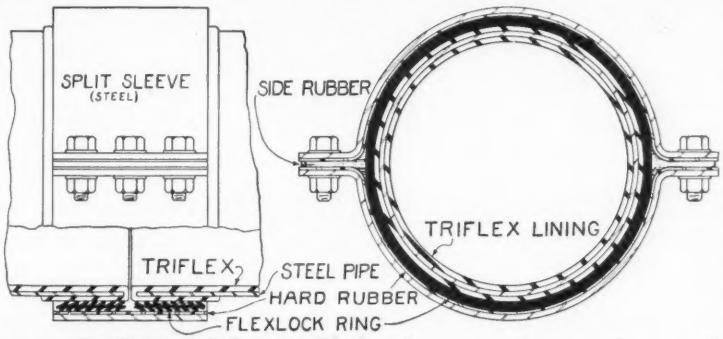

Fig. 14. The Flexlock Split Sleeve Coupling Assembly.

✦ ✦ ✦

SPECIAL expansion joints are not required with this construction. When the pipe is installed a space of approximately ¼-in. is allowed between the pipe ends. The gaskets continue to seal, regardless of the expansion or contraction in the line.

✦ ✦ ✦

THE built-in expansion joints prevent buckling or cracking of the rubber lining in individual lengths of pipe.

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WITH the use of the ceramic pipe there was always the danger of its being shattered or cracked due to physical abuse. The rugged construction offered by steel pipe eliminates all such worries. However, it is an easy matter to replace an individual pipe length should the occasion arise. Due to the fact that a ¼-in. space is left between the pipe ends at time of installation, it is possible to remove a damaged length and insert a replacement without disrupting any other portion of the line.

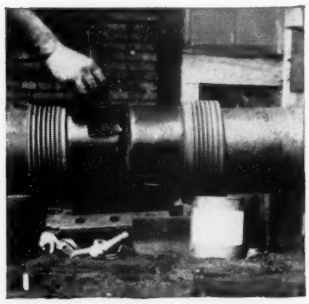

Fig. 15. ✦ ✦ ✦

Fig. 16. ✦ ✦ ✦

Fig. 17. ✦ ✦ ✦

Figures 15 to 19, inclusive, show steps in assembly of Flexlock coupling.

Fig. 18. ✦ ✦ ✦

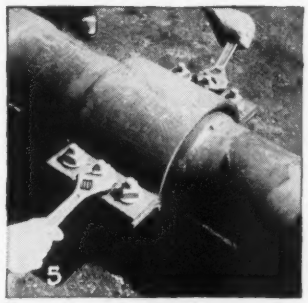

Fig. 19. ✦ ✦ ✦

Fig. 20. Supports for pipe ends in position.

THIS acid sewer line has now been in service for 18 months without any signs of leakage. As a result of this highly satisfactory performance, the owners feel confident that with this installation they have eliminated all problems of acid disposal for years to come. (See Figs. 20 and 21).

✦ ✦ ✦

THE news of the success of the above line soon became known through the steel industry and installations have since been made in a number of other plants. The following lines have been installed at various steel companies and are all Triflex-lined steel pipe coupled with Flexlock gaskets and rubber-lined split steel sleeves.

2,230 ft.	16″ size
2,000 ft.	8″ size
630 ft.	12″ size
100 ft.	10″ size

An order is now being fabricated consisting of 1,700 ft. of 18″ and 300 ft. of 8″.

✦ ✦ ✦

THE 18″ sewer at Inland is installed in an ideal way, that is, in a concrete trough which permits inspection at any time that it is felt necessary to do so. If suitable outside protection against soil corrosion is provided such waste acid lines can be buried. (See Fig. No. 22).

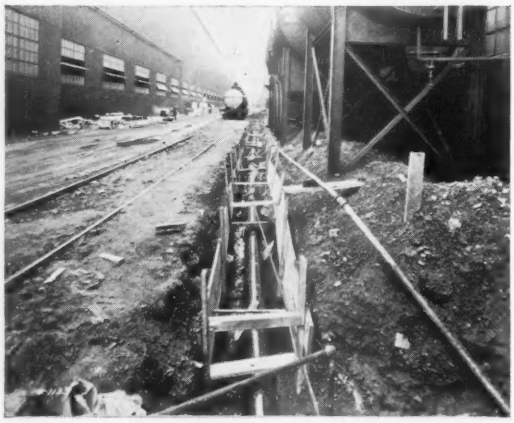

Fig. 22. 8″ pipe line laid in ditch before being buried.

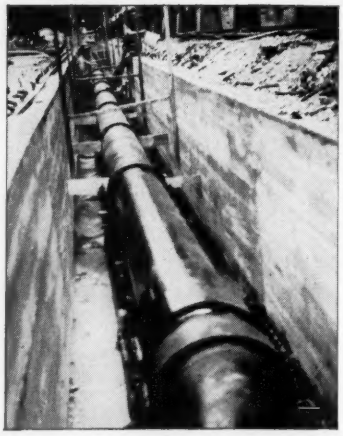

Fig. 21. Pipe line with completed joints.

✦ ✦ ✦

IT is a tribute to the vision and progressive spirit of the steel men of today that the traditional complacent attitude in regard to pickling room wastes and hazards has almost disappeared. Costs per ton are being steadily reduced and working conditions immeasurably bettered by the increasing effort devoted to more efficient and safer methods of handling acid.

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Stainless Steel Plant Doubles Production Capacity

Rustless Iron and Steel Corp., of Baltimore, Md., formally opens additions to its stainless steel plant. Capacity increased to 40,000 tons of stainless steel ingots and 12,000 tons of rerolling and forging billets and hot and cold finished bars and wire.

ON Sept. 30th the Rustless Iron and Steel Corporation doubled its production capacity with the formal opening of a new $1,500,000 addition to its stainless steel plant, providing for a 20,000-ton expansion of the Company's annual ingot capacity. It is said that this is the world's only plant exclusively engaged in the production of stainless steel, and the only one performing every step in the manufacture of stainless steel bars, rods and wire, from the virgin chrome ore to the finished product.

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YEARLY capacity has been increased to 40,000 tons of stainless steel ingots, and to 12,000 tons of rerolling and forging billets and hot and cold finished bars and wire.

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COMPLETION of this plant addition is designed to retain for Rustless its position among the three or four leading producers of stainless, the specialty metal which has become known as the jewelry item of the steel industry. With conventional steels selling at an average price of about 2c a pound, stainless in its various forms sells at from 20c to 50c a pound.

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THE plant was inspected by Baltimore public officials, executives of other Baltimore industries, visiting heads of other companies prominent in the steel industry, manufacturers of stainless steel products, and representatives of national business and industrial associations.

AFTER a luncheon at the Belvedere Hotel, the guests visited the plant and were shown the Rustless process of stainless steel manufacture, the methods of laboratory control to insure standard quality, and typical applications of stainless steel in dairy equipment, beverage bottling machinery, chainlink fencing, valves, pump shafts, turbine, automotive and machinery parts, and other uses requiring unstainable properties, great strength, and a high degree of resistance to heat and corrosion. They were told that metallic corrosion causes a world economic loss which has been estimated at $3,000,000,000 (three billions) yearly.

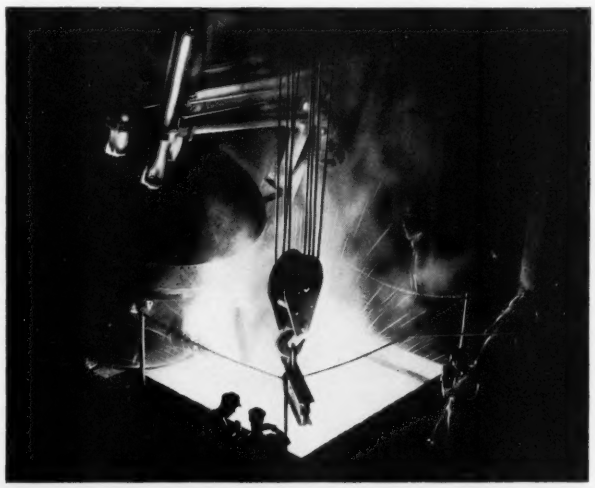

Fig. 1. Pouring stainless — the jewelry item of the steel industry. Three more of these 12-ton electric furnaces will be added in the corporation's plant expansion.

✦ ✦ ✦ ✦ ✦

IN addition to a modern three-high type 12-inch merchant bar mill housed in a 240 by 80-foot monitor type building and equipped with a 10-ton, 80-ft. span overhead crane, billet heating furnaces, cooling pit, etc., the new additions include three 12-ton electric furnaces, equiped with 3500 KVA transformers, a 60 by 323-foot brick and steel building housing equipment for cold drawing and finishing rustless steel bars in straight lengths; a two-story service building, containing a dispensary, lockers, shower and dressing rooms, and personnel office, a new electrical substation and transmission lines; cranes, storerooms and transportation equipment.

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OTHER facilities at the company's plant include a 20-inch blooming mill, and 14-inch and 9-inch bar and rod mills; grinding equipment, annealing and pickling and heat treating departments; a wire mill containing 16 draw-blocks and equipped to cold draw stainless steel rods and coils into wire; bridge cranes for the handling and storage of raw materials; and chemical, metallurgical and research laboratories. The addition was designed and construction supervised by the corporation's engineering staff and by H. A. Brassert & Company, of Chicago.

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THE manufacture of stainless steel is here characterized by the most rigid control of quality and uniformity of product.

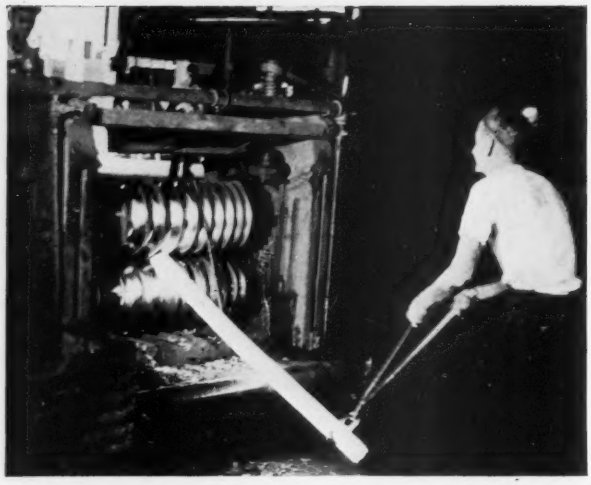

Fig. 2. The making of stainless steel requires hand craftmanship by men long experienced in the industry. Here a veteran steel man rolls bars of stainless.

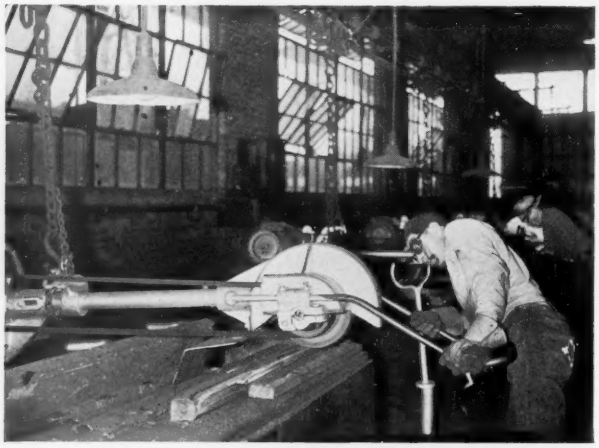

Fig. 3. Grinding stainless steel billets.

This is accomplished by the use of carefully selected raw materials, by the use of the most modern equipment manned by a highly trained personnel, and by the most scrupulous inspection and testing of the product throughout the various processing operations.

✦ ✦ ✦

STEEL-MAKING or melting is conducted in modern electric steel furnaces of 25,000 pounds capacity. The incandescent molten steel is poured into moulds of special design where it solidifies to solid metal. Ingots are the initial form of the metal as it comes from the moulds and each weighs from 1,000 to about 12,000 pounds. The quality and homogeneity of the metal in the ingot is insured not only by a steel pouring practice especially adapted to stainless steel but also by virgin chromium metal reduced from chrome ore. During the electric furnace steel-making process such chromium metal constitutes the primary source of chromium for alloying purposes with iron to form a chromium-iron alloy known as stainless steel. In this respect this Corporation enjoys unique advantages because of the special patented steel making processes which it developed over a period of years at Baltimore.

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THE ingots then go to the blooming mill, where the first step is the production of billets or sheet bars, semi-finished forms of steel. For this purpose the ingots are heated to the proper rolling temperature for the proper length of time in oil burning furnaces controlled by automatic temperature regulating and recording devices, thus reducing the human element to a minimum. The surfaces of the obtained products are then completely ground off by means of powerful grinding wheels in order to remove the superficial oxide coating and defects or irregularities introduced during the first rolling operation, exposing bright metal beneath. The billets and sheet bars are carefully inspected at this stage for all real defects of the metal as such. From billets are derived, by further rolling, bars of all shapes and sizes, as well as wire and wire products. Some of the latter, notably stainless steel spokes, are used in modern automobile steering wheels and are shipped from the plant in a condition ready for assembly.

✦ ✦ ✦

AFTER rolling, the products of the rolling mills are given the required heat treatment to yield whatever special mechanical and corrosion resistant properties may be most suited to the customer's needs. They are then thoroughly cleaned on their entire surface by "pickling" which removes all traces of oxide film and leaves the metal again bright and gleaming. At this point all of the products are again inspected minutely for possible defects or flaws. A certain proportion is further processed by cold drawing to wire and there is a separate inspection after each drawing operation until the final size and surface finish of the cold drawn product is obtained. Then a final inspection is made before shipment.

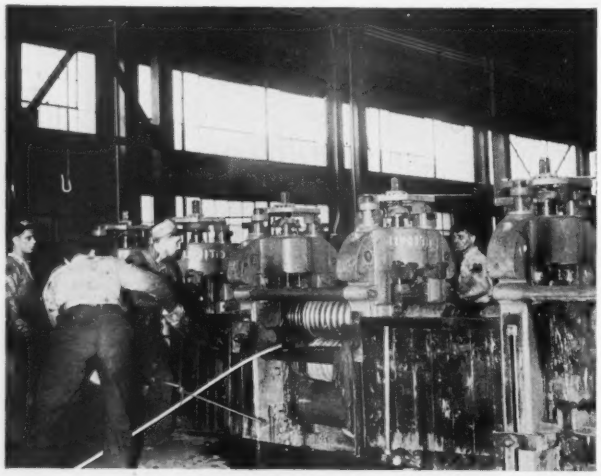

Fig. 4. Hot rod rolling of stainless steel.

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ALL processing operations are accurately gauged to the needs of this very highly specialized

type of steel, an accomplishment which is difficult at best in steel plants producing a wide variety of steel types. This specialization begins, of course, in the steel-making process itself but is continued through rolling and subsequent operations. These are conducted by an operating staff of specialists in stainless steel production and working in close cooperation with them is a highly trained metallurgical staff. The utmost care is exercised to insure that the obtained products have everything to be desired in the way of uniformity and quality.

✦ ✦ ✦

THESE all-important properties are obtained and maintained by a high standard in the testing and inspection of all products from the cast to the finished condition. One of the first steps is that they have to meet the acid test to insure that they are internally sound and clean. This test is generally carried out after the first rolling, but frequently repeated at later stages or even in the final condition, and consists of etching full cross sections in accordance with standardized methods. This procedure permits only materials of highest quality to be approved for shipment to the consumer.

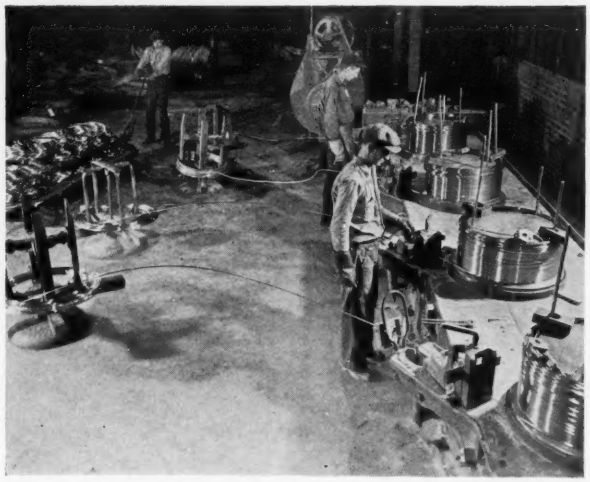


Fig. 5. Drawing stainless steel wire. ✦ ✦ ✦

THIS first demand—clean, sound steel—being met, numerous additional tests are conducted, to insure that the various specific requirements of the individual customers are met. They include examination of physical properties, toughness, ductility, hardenability, endurance, corrosion, abrasion and heat resistance and other special features important in the ultimate application of the material. It is here that close supervision and the experience of experts in their profession count a great deal in rendering clean sound steel fit for highest requirements of various industries. While this work is done in routine fashion, with the help of modern laboratory equipment, constant research is carried on to improve and develop new products and processes, as well as finding additional applications in the constantly growing field of the most recent development of steels; the stainless steels.

✦ ✦ ✦

THE stainless steel products of the Corporation have met the most rigid requirements imposed by the consumer trade. To emphasize the necessity for a flawless product, it should be recalled that in many applications a mirror-like polished surface is required and here even the slightest defect becomes apparent, even to the untrained eye. Needless to say, stainless steel is produced today to conform to a large number of different types distinguished by differences in chemical analysis. In its melting operations metal is regularly manufactured to the most exacting chemical analysis known to the industry as a matter of routine.

✦ ✦ ✦

ACTUAL figures on production and sales in the stainless industry have always been shrouded in mystery, and even the most responsible authorities have differed in their estimates. The American Iron and Steel Institute's statistical report gives an estimate of 90,966 tons of ingot production of stainless for last year, while the

(*Please turn to Page 740*)

Fig. 6. Annealing furnace intake. ✦ ✦ ✦ ✦

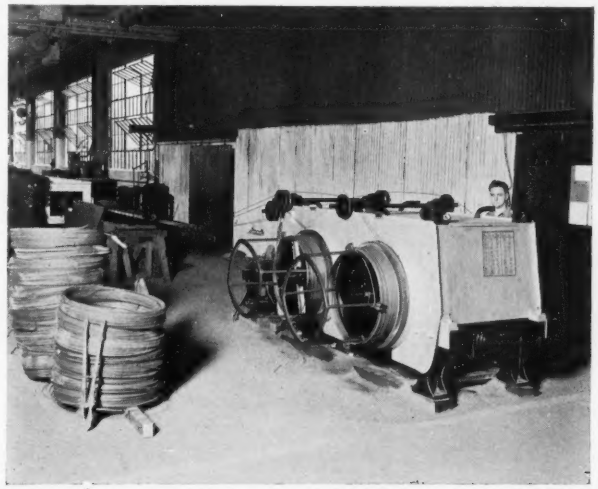
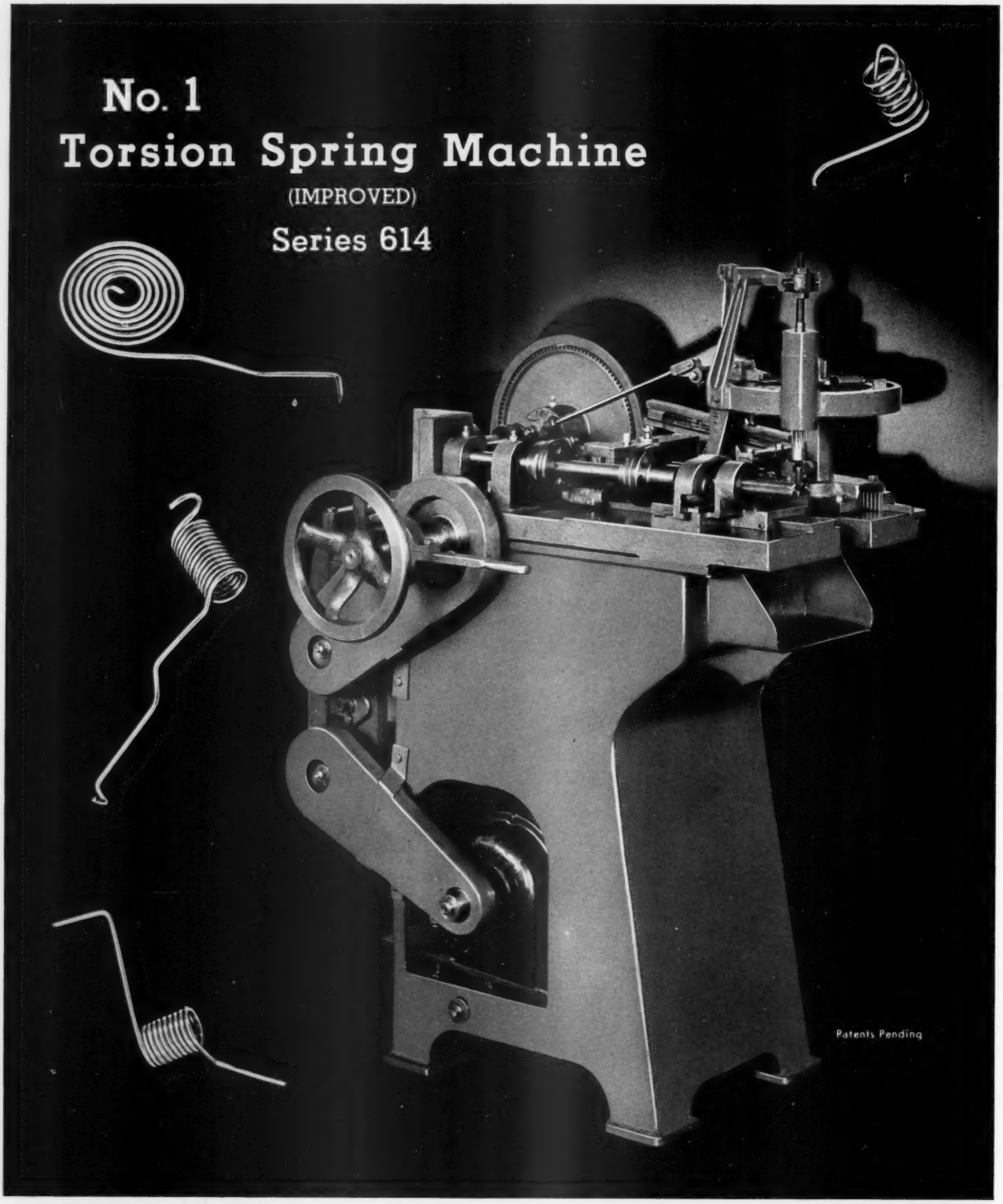


Fig. 7. Annealing furnace outgo. ✦ ✦ ✦ ✦



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J. W. Rockefeller, Jr., Section Editor.

Vol. 12 NOVEMBER, 1937 No. 11

Electric Direct Resistance Patenting And Tempering of Spring Wire

O. C. Trautman,

The Cleveland Electric Illuminating Company

For over a year The Cleveland Wire Spring Co., Cleveland, has used direct electric heat treating for the thermal treatment of spring wire. The following article deals with more recent developments of this process, wire patenting and the results obtained by this method of patenting. ✦ ✦

THE Process consists of heating the wire to the quenching temperature by means of passing an electric current through it and subsequently quenching it through a definite temperature range depending on the structure desired. Both the rate of heating and cooling can be controlled with an accuracy and facility that cannot be equalled by any other method.

✦ ✦ ✦

FIGURE 1 illustrates diagrammatically the patenting of wire by the Electric Direct Resistance method. The wire to be treated is fed from reels, through tension rollers and individually controlled electric contact members where low voltage current is applied to heat the wire. Suitable atmosphere may be provided during the heating cycle to prevent the formation of any scale or undesired surface condition. The temperature of the wire increases until the desired quenching temperature is reached just as the wire enters the quenching bath which consists of molten lead or other suitable material. The quenching temperature of the wire is controlled automatically by means of a photo-electric cell unit, the optical system of which, is so designed that the image of the heated wire is projected to cover the cathode of the photo-electric cell. This unit operates in conjunction with an apparatus which regulates the E. M. F. applied to the wire and holds the temperature of the wire within 5 degrees plus or minus of desired quenching temperature. After going through the necessary cooling cycle, the wire passes through the electrolytic pickling unit and a subsequent rinse. The occluded hydrogen is driven off by resistance heating to approximately 400° F. The wire is then copper coated, limed, or given other surface treatment depending on the drawing which is to follow. At this point the wire is pulled up on the take-up reels and is ready for drawing.

✦ ✦ ✦

FIGURE 2 graphically illustrates the time-temperature curve of the Electric Direct Resistance process. The whole apparatus is so designed that all the operations such as pickling, coating, and baking may be done continuously; and the wire is ready for further drawing when it reaches the take-up reels. A great deal of handling time can be eliminated in this manner as can be readily seen by contrasting this method of pickling, coating and

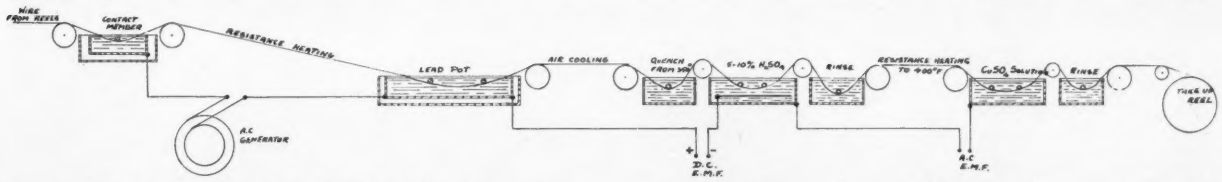

Figure 1. Diagrammatic sketch of the Electric Direct Resistance process. ✦ ✦ ✦ ✦ ✦ ✦ ✦

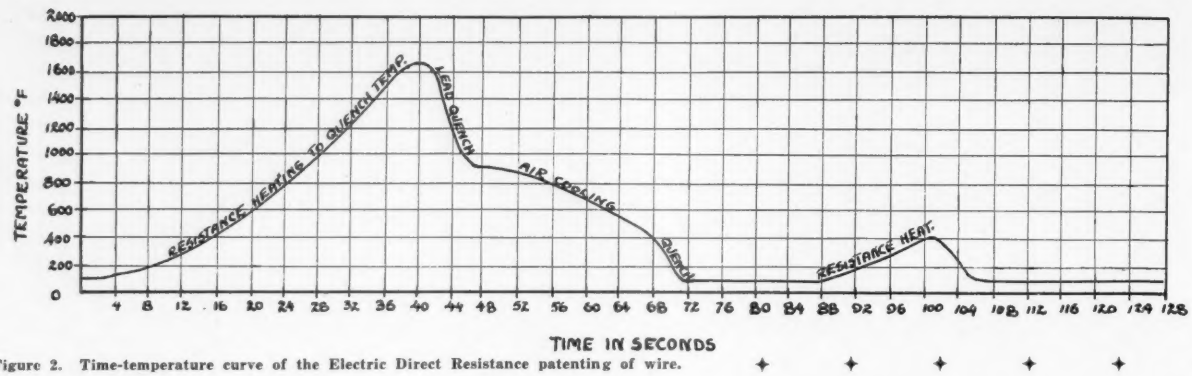

Figure 2. Time-temperature curve of the Electric Direct Resistance patenting of wire.

baking to the usual batch operations used in ordinary practice.

Patenting Without Special Atmospheres

THERE is practically no scale developed even on wire run without the use of special atmospheres. The scale from such wire was removed by an 8 to 10 second dip in a 5% acid solution. Figure 3 shows the surface of electrically treated wire which was patented without the use of a special atmosphere during the heating cycle. The apparatus is very flexible and is adaptable to any time-temperature arrangement.

Operating Costs

IN the conventional practice of the patenting of wire, maintenance costs of the equipment are quite high. In the case of furnace heating the problem of refractories and their maintenance becomes a real problem since the high furnace temperatures used break down these refractories very rapidly. In lead pot heating a considerable amount of lead is lost through oxidation and maintenance costs are high due to the rapid deterioration of the pots. In either case, considerable time is required to bring the furnace or pot to the working temperature. With such methods the heating rate is more or less fixed and the speed at which the wire travels to the take-up reels is rather slow, usually only a few feet a minute.

AS a contrast, in the patenting of wire by the Electric Direct Resistance method, no furnace is required, merely an enclosure which serves to confine the atmosphere in which the wire is heated, if a special atmosphere is used. The wire attains the quenching temperature in a few seconds since the heating rate is not dependent upon the thermal conductivity of wire being heated, the furnace temperature and other external influences. Far greater speeds than those used in ordinary proceduces are possible. There are practically no maintenance costs on the equipment.

Effects on Grain Structure

IN conventional practices of the patenting of wire, that is, furnace or lead pot heating, it is found necessary to heat the wire considerably above its critical range to induce grain growth which larger grain tends to enhance the homogeneity of the structure. Since ferrite deposits at the grain boundaries of the solid solution, the larger the austenitic grains, the less ferrite will deposit at a given cooling rate, and the homogeneity of the structure will therefore increase with the increase in temperature and the duration of heating. The larger grain is not necessarily accompanied by the greatest ductility, rather the distribution of the various constituents plays a more important part in the plastic deformation and cold flow of metals as experienced in wire drawing. The reason for the high temperatures necessary for the patenting of wire by the conventional method is not merely to obtain a coarse grained structure in the product, but rather to secure a better dispersion of ferrite and carbide throughout the structure. Figure 4 shows a typical lead patented structure. The patenting, in this case, was very good. The pearlite in this structure is in the sorbitic state which is most adaptable to drawing. This structure however, does not react as favorably to the drawing operation as the electrically patented wire. Figure 5 illustrates an air patented

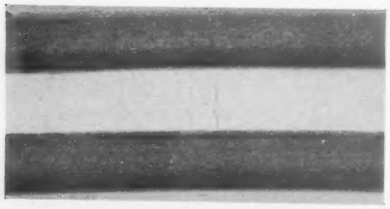

Figure 3. The surface condition of electrically treated wire, magnification X6, patented without the use of a special atmosphere during the heating cycle. (See Fig. 6 for comparison with air patented wire.)

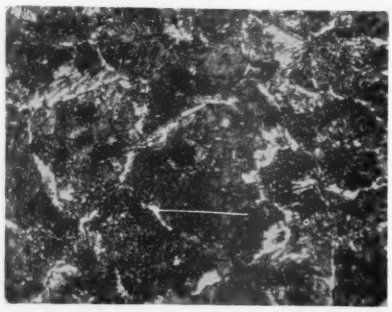

Figure 4. Conventional lead patented structure. Magnification X2000.

Figure 5. Air patented structure. Magnification X2000.

structure, X 2000. The laminated condition of the pearlite can be easily distinguished at this magnification. From this microphotograph it can readily be seen that some of the lamallae will be directly opposed to the direction of drawing, the fracture will result after a material reduction in area is accomplished in drawing.

✦ ✦ ✦

IN the ordinary procedures of the patenting of wire, the methods of heating used, fix the temperature at which grain coarsening begins to take place, just above the upper critical point. The rate of heating in methods which depend upon the thermal conductivity of the material being heated, the furnace temperature, etc., to establish

Figure 6. Surface condition of air patented wire, magnification X5. ✦ ✦ ✦

the rate of heating, is more or less fixed. The temperature of the solution of alpha iron and the point at which grain growth sets in is dependent on the rate of heating. With a slower rate of heating, the usual transformations take place more slowly than would be the case if a more rapid rate of heating was possible. It is possible, by increasing the rate of heating, as can be done by this method, to accelerate the solution of alpha iron and to raise the temperature at which grain coarsening generally sets in. No evidence of grain growth was found even in samples over heated several hundred degrees above the upper critical point by the resistance method.

✦ ✦ ✦

THE more rapid rate of the solution of the alpha iron, as evidenced in resistance heating, may be explained in that there is a resistance built up between the very rapidly forming face centered cubic lattice crystals of gamma iron and those body centered cubic lattice crystals of alpha iron which have not yet transformed and that this increased resistance tends to accelerate the whole phenomenon of solution.

✦ ✦ ✦

Surface Decarburization

SURFACE decarburization of the wire is another problem encountered in the usual procedures in patenting wire. Figure 6 illustrates the surface condition of a typical air patented wire. During the necessary soaking period in the heating cycle, in the case of furnace heating, the carbon content of the surface of the wire is depleted through oxidation. The resulting product has a lower carbon exterior. Figure 7, magnified X 500, shows an air patented structure with surface decarburization.

✦ ✦ ✦

Uniform Heating

IN the patenting of wire by this method, a finely dispersed sorbitic structure can be produced without the use of temperatures quite as high as those used in other methods. With this type of heating, uniform heating is obtained throughout the cross section of the wire and the quenching is done on a rising heat, that is, the wire is still being heated when it enters the quench bath. Any temperature desired can be attained quickly and easily, and any temperature changes necessary during operation can be effected very rapidly. Far greater wire speeds can be used than those possible in ordinary pattenting procedures. Wire treated by this method has a structure which most readily submits to severe deformation such as wire drawing because the pearlite is in the form of extremely thin plates, that is, a fine troostitic sorbitic structure. The thinner the plates of cementite in the pearlite, the more easily they may be deformed.

✦ ✦ ✦

Physical Properties of Product

ALTHOUGH physical properties are not an absolute criterion of the drawing qualities of a patented wire, they give some indication as to how the wire will react to plastic deformation. The electrically patented wire has excellent physical properties, (table, figure 8), as compared to conventionally patented wire; the reduction of area is well over 60%.

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THE structure of the electrically patented wire is shown in Fig-

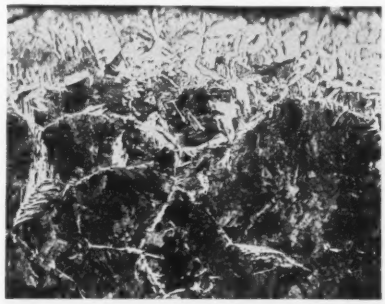

Figure 7. Air patented structure with surface decarburization. Magnification X500. ✦

ure 9 X 2000. Note the fine sorbitic structure, even at this magnification, and the even distribution of the various constituents.

✦ ✦ ✦

SAMPLES of the electrically patented wire were drawn down from .0915" to .0175", using the following practice.

.0915" — 6° — .0315"
copper coated
.0315" — 7° — in continuous machines to .0175"

✦ ✦ ✦

THE physical properties of the wire after drawing from .0915" to .0175" are given in the following table A.

FIGURE 8

	Elastic Limit	Yield Point	Tensile Strength P.S.I.	% Elong.	% Red.	Rockwell C
Elec. Pat.	84,000	105,200	158,000	11.5	62	26-28
Air Pat.	68,400	89,100	146,500	9.0	29.2	31-34

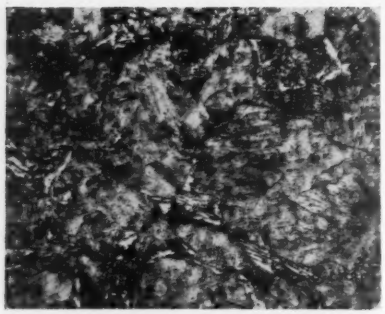

Figure 9. Showing Electrically Patented Wire (.0915). X2000. ✦ ✦ ✦

FIGURE 10 illustrates the electrically patented structure after drawing through a 96.35% reduction in area.

✦ ✦ ✦

Conclusions

Through Electric Direct Resistance a product with higher physical properties and a structure more adaptable to the operation of wire drawing is obtained.

There is no surface decarburization and practically no scale even on wire patented without the use of a special atmosphere.

The thermal efficiency of the process is high (approximately 95%).

The equipment is flexible and is easy to operate.

There is an elimination of high temperature furnaces and lead pots with corresponding high maintenance costs.

There is an elimination of a great deal of handling time, to and from pickling vats, coating operations, baking ovens, etc., as all these operations are done in a continuous process.

The temperature of the wire being treated can be raised or lowered quickly and accurately.

The wire is quenched on a rising temperature and exactly at the temperature required instead of on a temperature that is falling as in the conventional methods.

Greater wire speeds are possible, consequently greater production.

The control of heating and quenching cycles is very accurate.

Figure 10. Showing the Structure After Drawing the .0915 Electrically Patented Wire to .0175, (a 96.35% reduction). X3000. ✦

TABLE A

Sample	Size	P. S. I.	Torsions in 8"
1st end	.0175	354,000	101 - 108
last end	.0175	350,000	105 - 106

Part II will be published in the December issue of Wire and Wire Products.

Recent Literature on Springs

"SPRING Design Charts for Cylindrical and Conical Springs"—V. TATARINOFF Product Engineering, September, 1937.

Contains charts for the calculation of helical and conical springs of steel and brass wire together with a table of safety factors based upon the type of service the spring is designed for. The charts are based upon formulas incorporating the Wahl factor.

✦ ✦ ✦

"GOOD Commutation Needs the Right Brush Springs"—Heinz A. Mueller, Electrical Manufacturing, September, 1937.

To insure low contact drop between brushes and commutators, or between brushes and slip rings, on electrical machines and to minimize brush vibration calls for good engineering thinking and specification for brush spring and holders. How to correctly specify the design and materials for this small but truly important factor in satisfactory motor performance is the objective of this discussion by Mr. Mueller who is designing engineer with the Stewart-Warner Corp.

"NUMBER of Turns Delivered by Flat Coil Springs"—The Mainspring—August, 1937. Published by the Wallace Barnes Company, Bristol, Conn.

Contains charts and formulas for the calculation of the properties of volute springs from a known inside diameter of case, diameter of arbor and length and thickness of the spring.

✦ ✦ ✦

A. S. & W. Base Prices

THE American Steel & Wire Co. has reaffirmed present fourth quarter base prices of wire and wire products for shipment in the first quarter of 1938 (i.e., until March 31, 1938) subject to any change in freight dates at the time of shipment.

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Vol. 12 NOVEMBER, 1937 No. 11

Some Characteristics of Cold Heading Wire

By A. M. Reeder,

Metallurgical Engineer,

Jones and Laughlin Steel Corp., Pittsburgh, Pa.

It is important that the wire manufacturer have complete information from the buyer of wire regarding the various operations to which the customer is to subject the wire, in order that the manufacturer can produce a quality of wire with the best balanced combination of those properties. A description of such required characteristics is presented herewith. + +

THE primary requisites of cold-heading steel wire of any specified chemical analysis, are malleability, surface quality, and finish. The successful application of the wire to the production of a particular cold upset part will depend upon the proper balance of these factors, and the manner in which the upset is produced. Other factors which have varying degrees of significance depending on the application involved, are machinability, heat-treating characteristics, and physical properties such as hardness, torsion, tensile, impact and elongation.

+ + +

THE "ideal" cold-heading steel would be one which for a specified analysis, exhibits maximum malleability and machinability, and after heat-treating, the finished product possesses the most desirable combination of physical properties. While such a steel does not actually exist, it is the aim of the manufacturer to produce a quality of wire with the best balanced combination of those properties for the particular application involved. It is, therefore, important that the wire manufacturer have complete information regarding the various operations to which the customer is to subject the wire during its application. Incomplete information as to the requirements leads to confusion, which results in a loss, both to the wire manufacturer and to his customer. Conversely, detailed information as to the operations involved and final properties to be obtained in the finished part, will enable the wire manufacturer to proceed in the most intelligent manner in the steel application and processing operations.

+ + +

COLD-heading wire a few decades ago was confined almost entirely to the low-carbon basic grade of about SAE 1010 analysis. Cold upsets equivalent, for example, to carriage bolts were usually produced from wire annealed in process. High carbons such as SAE 1035, were not considered cold-heading grades in any form. The limiting maximum wire size upset cold was in the neighborhood of ½". The cold extrusion process had not yet been developed and little attention was given to the relation of wire finish to die life.

+ + +

TODAY this picture is radically different. Many cold-heading manufacturers have, for the sake of economy, adopted the use of direct drawn wire for certain difficult upset parts where previously, a processed wire had been applied. Cold-heading machines have been developed capable of heading the higher carbon and manganese as well as high carbon steels, and at speeds considerably greater than any heretofore applied. Both single and double extrusion in conjunction with heading is now regular practice, and special wire finishes are a necessity. Many cold-headed parts are often subjected to a considerable amount of machining and therefore in producing the wire for such parts, the steel manufacturer is requested to supply a steel with a certain minimum degree of machinability. In the medium, and particularly the higher carbon grades, not only are the various heading characteristics important, but heat-treating properties must be given special consideration.

+ + +

CONSEQUENTLY, to keep pace with the demands of the rapidly expanding cold-heading indus-

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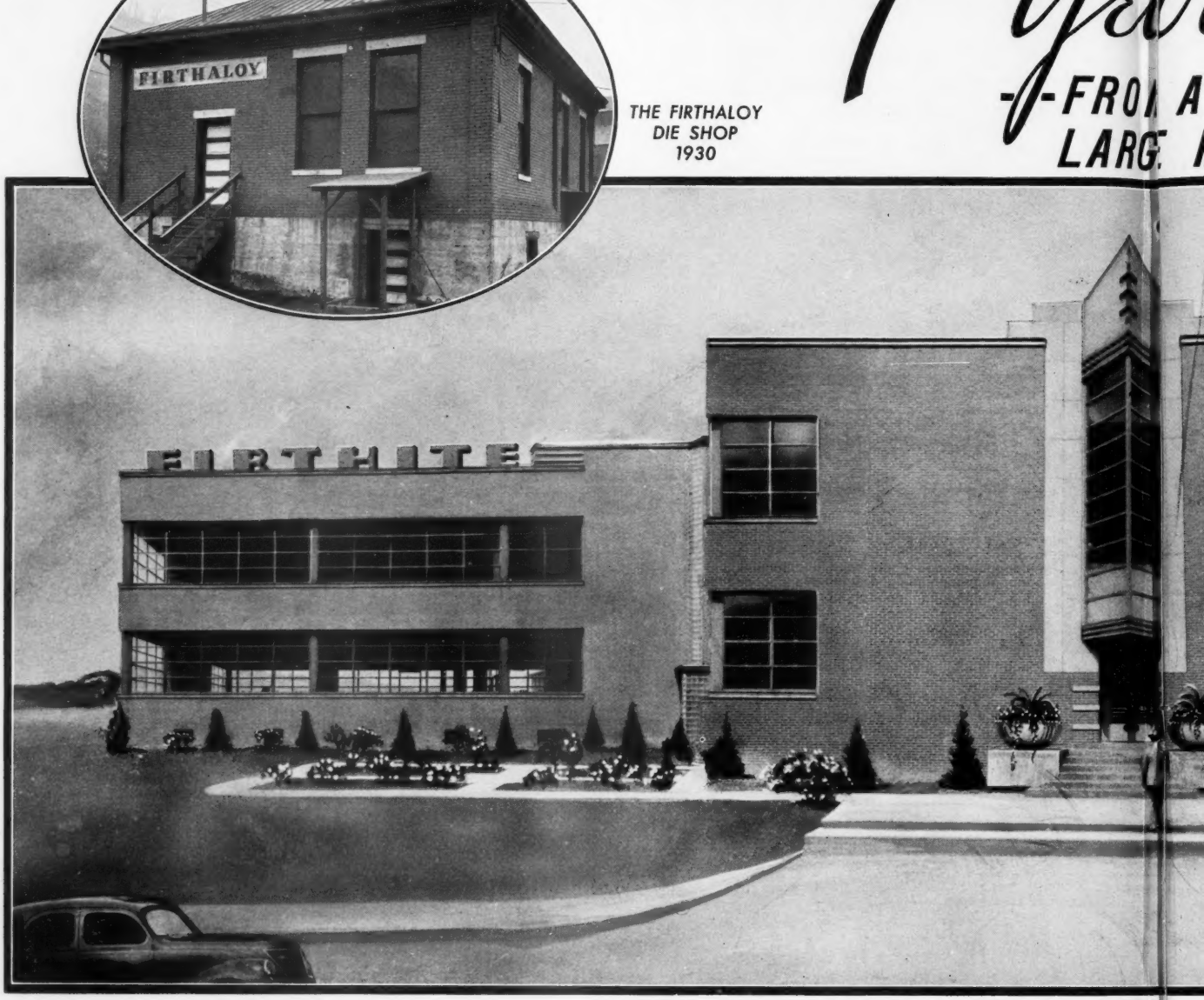

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TABLE I
CHEMICAL SPECIFICATIONS OF VARIOUS COLD HEADING GRADES

TYPE	C	M	P	S	Si.	INGOT PRACTICES
SAE 1010	.05/15	.30/60	.045	.055	—	
Variations of SAE 1010 often specified	.09 max.	.40 max.	.04	.05	—	Rimmed or killed.
	.08/12	.40/60	.04	.05	—	Rimmed or killed.
SAE 1015	.10/20	.30/60	.045	.055	—	
Variations of SAE 1015 often specified	.15/20	.60/80	.040	.050	—	Rimmed or killed.
	.12/16	.40/60	.040	.050	—	Rimmed or killed.
	.14/19	.30/60	.040	.050	—	Rimmed or killed.
	.14/19	.30/60	.040	.050	.07/15	Killed
SAE 1035	.30/40	.50/80	.045	.055		
Variations of SAE 1035 often specified	.27/35	.70/90	.030	.050	.07/15	Fine or coarse grain
	.35/40	.70/90	.030	.050	.07/15	Fine or coarse grain
	.32/37	.65/85	.040	.050	.10/20	Fine or coarse grain

try, the wire manufacturer has been faced with the necessity of applying more and more special attention to steel making and rolling mill practices, and wire mill processing operations. Special analyses have been originated; steel making and ingot practices most suitable for the production of each particular grade and application have been developed; special billet rolling and reconditioning practices have been instituted.

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GREATER emphasis has been placed on the various operations involved in the wire mill; inspection and testing standards have necessarily been raised. Consequently, cold-heading wire as produced today is markedly superior to that of a decade ago.

✦ ✦ ✦

Steel Grades

THE widening application of cold-heading wire to parts which were previously hot forged or machined from bar stock, has resulted in a considerable increase in the number of steel grades. To meet the required upsetting, heat-treating and machining requirements, various ramifications in ingot practices and chemical analyses have been resorted to. Table I shows a partial list of cold-heading grades as specified by various manufacturers. It will be noted that considerable similarity in analysis exists between various grades, many of them being slight alterations in certain SAE ranges. Standardization, wherever practical, should be considered for the sake of simplicity in manufacture.

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IN addition to the grades shown in Table 1 are various low-carbon grades of both Open Hearth and Bessemer steels with various amounts of added sulphurs for application to cold-headed parts, which are subjected to various amounts of machining in manufacture.

✦ ✦ ✦

Steel Making Practices

A MORE scientific control of the open-hearth furnace has resulted in the general improvement of cold-heading steels. Slag control and deoxidation practices of a higher order than heretofore account for a large percentage of the increase in malleability and surface quality. In the lower carbon grades of cold-heading wire, it is possible to control the steel refining process and freezing of the ingot to obtain certain important variations in the structure and physical characteristics. We refer here to the production of rimmed and killed steels and variations of each. It is generally conceded that a rimmed steel is to be desired where the degree of upset is especially severe for a low carbon bright wire and uniformity of ingot structure is not a factor. Rimmed steel may be rolled to rods with a surface relatively free from defects, providing the rimmed action has been carefully controlled. However such elements as manganese and sulphur in increasing amounts adversely affect the rimming action, and result in a product with poor rolling characteristics, consequently rimmed steels are limited as to the amounts of these elements which they may contain. By mechanically jarring the rimming ingot during solidification, however, it is possible to materially increase the sulphur and manganese content in the steel and still obtain a well rimmed structure and satisfactory surface characteristics. Advantage is taken of this procedure in the production of cold-heading steels with free machining properties.

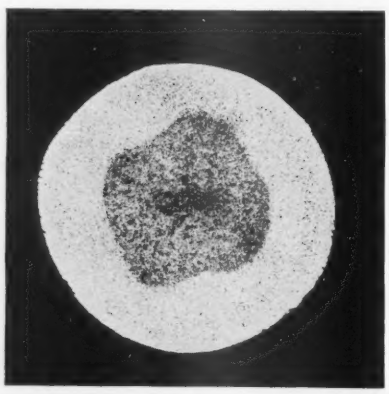

Fig. 1. X6. Cross-section through rimmed steel cold-heading rod.

✦ ✦ ✦

IT must be remembered however that during rimming, a definite segregation of the elements, particularly carbon and sulphur, takes place in the core metal, especially toward the upper central portion

of the ingot. Figure 1 is a macrograph of an etched cross-section through a rimmed steel rod. Chemical analyses were made of a complete cross-section as well as analysis of rim and core metal, with the results shown in Table II.

TABLE II

	C	M	P	S
Cross-Section Analysis	.18	.43	.012	.035
Rim Metal	.17	.42	.012	.033
Core Metal	.18	.43	.012	.036

TABLE III

	C	Mn	P	S
Full cross section	.17	.43	.012	.035
Rim metal	.11	.42	.012	.029
Core metal	.21	.45	.012	.043

✦ ✦ ✦

THE higher the percentage of these elements present in the ladle analysis of the heat of steel, the greater will be the variation in analysis between the top and bottom of the rimmed ingot. However, the gradual positive segregation toward the upper portion of the ingot generally does not present a problem in cold-heading steels, since the thickness of the rim metal likewise increases as freezing progresses upward in the ingot. The rim metal because of its relative purity as compared to the core, not only possesses the greater desired malleability for cold-heading, but is particularly adaptable to roll-threading.

✦ ✦ ✦

THERE are certain parts produced from cold-heading wire where two distinct ingot patterns, such as exhibited by rimmed steels, would be undesirable, and in such cases it is preferable to use a semi-killed or thoroughly killed steel.

✦ ✦ ✦

SUCH steels generally possess a somewhat more desirable surface metal for cut-threading than the regular rimmed cold-heading steel, with a correspondingly lesser degree of malleability for cold-heading. Due to the absence of escaping gases during solidification, killed steels solidify with a fairly homogeneous structure and much less segregation of chemical elements than in the case of rimmed steels. (See Figure 2, and Table III).

✦ ✦ ✦

HOWEVER, there is considerably more tendency for the formation of shrinkage cavities in the upper central part of the ingot, and necessary steps for removal of this undesirable area must be taken during and after the rolling operations. A refractory top is often employed to control the rate of freezing near the top of the ingot so that piping may be reduced to a minimum and a higher yield of sound metal results.

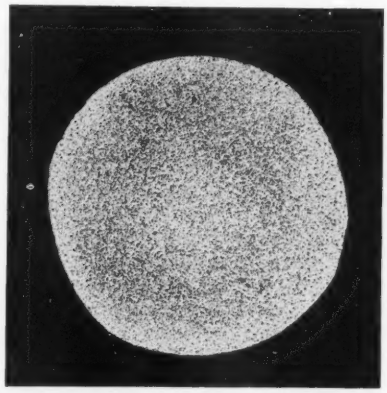

Fig. 2. X6. Etched cross-section of killed steel rod. (See Table III for analysis) ✦

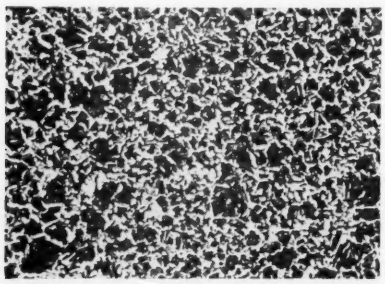

Fig. 3. 100X. Hot rolled rod structure. Inherently fine grained steel. ✦ ✦

✦ ✦ ✦

Grain Size

THE subject of grain size with reference to cold heading steels has received considerable attention during the past few years. It is generally conceded that a coarse ferrite or ferrite - pearlite structure is highly conducive to plastic flow during cold heading. Hence a rod normalizing treatment has become general practice in the production of cold heading wire in the higher carbon grades, particularly SAE 1030 and 1035. Temperatures in the neighborhood of 1750° F. and prolonged soaking periods produce a grain size of 1 to 3, according to the McQuaid-Ehn chart, provided, of course, the steel is inherently coarse grained. In addition to improving the plastic flow of the metal, the rod normalizing treatment eliminates the variable hardness and structural characteristics present in the hot rolled rod.

✦ ✦ ✦

WHILE it is generally considered desirable to produce an inherently coarse grained steel for cold-heading wire, there are some general exceptions to this rule. When there is danger of quench cracking or excessive warpage during heat-treatment, it may be desirable to employ a fine-grained type in spite of the fact that cold heading characteristics may be somewhat adversely affected. Figures 3 and 4 are photomicrographs of coarse and fine grained types of steel (grade SAE 1035), as hot rolled to 15/32" rods. Rod finishing temperature

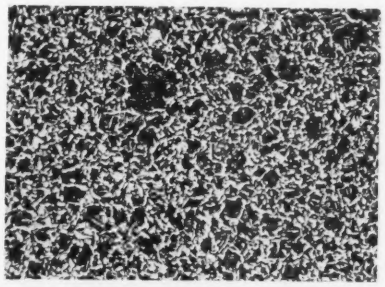

Fig. 4. 100X. Hot rolled structure. Inherently coarse grained steel. ✦ ✦ ✦

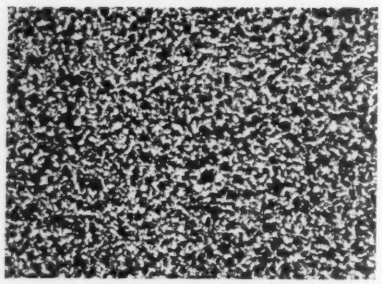

Fig. 5. 100X. Normalized structure. Inherently fine grained steel.

practically identical (1700° F.) for both types and practically no differences in actual grain size is to be noted. However, after normalizing at 1750° F. it will be seen that the difference in grain size is very noticeable. (See Figures 5 and 6).

✦ ✦ ✦

RIMMED steels may generally be considered as possessing a rim metal which is inherently coarse grained and a core which is inherently fine grained. This fact is important in considering the matter of case-hardening of rimmed steels, since the rim case will necessarily show structural characteristics somewhat different from the case developed in the core metal. Figures 7 and 8 are micrographs of the rim and core metal, respectively, of a .15/20 carbon hot rolled steel rod (same specimen as shown in Figure 1).

✦ ✦ ✦

Decarburization

MANUFACTURERS of cold-heading wire are thoroughly conscious of the importance of keeping the degree of decarburization to a minimum. Temperature control and furnace atmospheres are the subject of more attention today than ever before, and it is now generally conceded that the extent of decarburization existing in the wire as drawn from the hot rolled rod is of such minor extent as to cause little or no concern. Practically all harmful decarburization therefore occurs after the rod has been rolled, that is, when the rod or wire in process is subjected to normalizing, annealing or spheroidizing treatments or the bolt or other upset part is heat-treated. The importance of maintaining strongly reducing atmospheres in heat-treating furnaces is well recognized. Heating atmospheres containing as much as 15 to 18% combustible gases during rod normalizing generally is sufficient to prevent more than .004" total decarburization, which is considered as satisfactory. To obtain less decarburization would require an atmosphere with deoxidizing properties which would not be a considerably more costly matter, but might be very harmful through the reduction of scale to sponge iron. As a matter of fact, a few thousandths decarburization is generally considered an asset to cold heading, since it furnishes some cushioning effect to the heading blow, thus resulting in less tendency for the surface metal to develop a rupture, and at the same time increasing the life of the header punch.

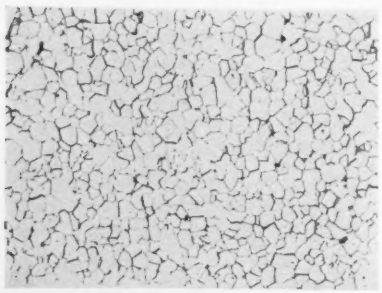

Fig. 7. Mag. X100. Microstructure of metal in rim.

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SO-CALLED deoxidizing atmospheres are becoming more common in connection with the bright annealing and hardening of bolts and other parts, and it is possible that the future will even see slight carburization effected by the proper atmosphere of this type, thus counteracting any previously decarburized zones.

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Coatings and Finishes

THE development of the extrusion process and its application to the heading operation has resulted in an intensive study of coatings and finishes. It was generally considered adequate in producing wire for the regular cold heading operation, as performed in open or split dies to coat the rod with a medium amount of sull and lime and draw through the ordinary soap and lime lubricant. However, as the extrusion die became more extensively used, it was recognized that much more in the way of wire coatings and finishes were required than for ordinary heading processes. It was discovered that the tightness, thickness and uniformity of the coating, as well as the type of lubricant used in the cold drawing operation all played a very important part in the successful performance of the wire during extrusion heading.

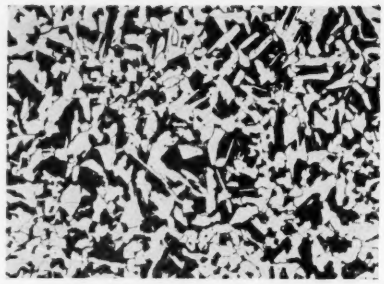

Fig. 6. 100X. Normalized structure. Inherently coarse grained steel.

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MANY cold heading shops still have their preference for certain types of coatings. Some claim that an extra heavy lime coat is required for most satisfactory extrusion, others prefer a heavy sull-coat, while still others seem to have greatest success in extruding a wire practically free from sull but with a uniform heavy lime and metallic soap lubricant.

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IT is hoped that the future will see an effort toward standardization of coatings and finishes, which will react to the advantage of all concerned.

(*Please turn to Page 739*)

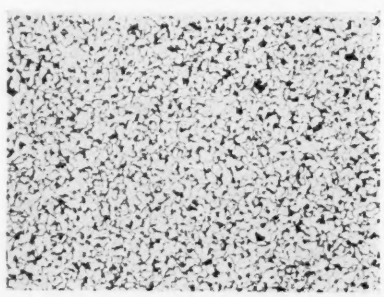

Fig. 8. Mag. X100. Microstructure of metal in core.

Wire Association Convention

By Richard E. Brown,
Editor, WIRE AND WIRE PRODUCTS

Medal award for 1937 presented to McCarthy — Honorable mention certificates to Sandelin and Dove — A record attendance — Excellent technical discussions and splendid exhibits in association with The National Metal Congress. ✦ ✦ ✦

THE Annual Convention of the Wire Association which was held at Atlantic City, N. J., from October 18th to 22nd inclusive, was marked by the greatest number of registered members and guests attending any of these meetings to date—by a very greatly increased interest in the papers presented and a marked willingness on the part of the speakers to exchange information on the subjects under discussion.

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THIS willingness is perhaps due to the new policy of the Association in editing the proceedings. Under this policy all speakers will have copies of their remarks sent to them for editing prior to their publication in the minutes of the meeting and in this way any errors or omissions or misquotations can be corrected and both the speakers and the members be assured of a correct presentation.

✦ ✦ ✦

IN this connection all who paid the registration fee at Atlantic City will receive one copy of the copy of the proceedings in about sixty days after they have been passed upon by the publication committee. To members of the Association who did not attend the meetings, copies are available at $2.50 each; to all others, $5.00 each.

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PRECEDING the opening of the technical sessions, there was a luncheon at the Ambassador Hotel tendered by the Wire Association to the directors, the authors of the papers and the program committee. Following this luncheon the procedure for the meetings was charted out and as a result the program under the leadership of **John C. Callaghan,** chairman of the Program Committee, functioned most efficiently and smoothly during the week.

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The Wire Association Annual Meeting

AT the annual meeting which was held at the Hotel Ambassador, Atlantic City, N. J., October 20th, **Mr. Ralph K. Clifford,** president of the Wire Association presiding, the following matters were discussed:

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THE annual report of the Secretary and Treasurer was presented and approved. This report showed that the Association had a membership of 302 on October 1st, 1937 and 321 on October 20th, 1937. This contrasted with the membership of 229 on October 1st, 1936.

✦ ✦ ✦

ATTENTION was called to the first Regional meeting of the Wire Association which was held at the William Penn Hotel, Pittsburgh, Pa., on May 21st, 1937. Arrangements for this meeting were made by **Mr. A. R. Zapp** of the Firth-Sterling Steel Co., McKeesport, Pa., who acted as chairman of the committee in charge and the meeting was conducted under the chairmanship of **Mr. F. A. Westphal,** Superintendent of Wire Mills, Sheffield Steel Corp., Kansas City, Mo., vice-president of the Wire Association. At this meeting a paper was presented by **Mr. B. L. McCarthy,** Metallurgist, Wickwire Spencer Steel Co., Buffalo, on the subject of "A Metallurgy of Steel Wire", and a paper was presented by **Mr. C. L. Harvey,** Lamson & Sessions Co., Kent, Ohio, on the subject of "Cold Heading Problems".

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PRIOR to the meeting, the Firth Sterling Steel Company held a plant inspection and gave a dinner to approximately 125, and this, in connection with the publicity given to the meeting, resulted in a registered attendance of 185. The meeting was considered to be so successful by all who attended that

Wire Association Medal Award Winner For 1937

BENJAMIN LEWIS McCARTHY

Born in Lockport, New York, in 1895. In 1913 was employed as Assistant Chemist by Simonds Saw & Steel Co. In 1916 was employed by Wickwire Steel Co., now known as Wickwire Spencer Steel Co., as Assistant Chief Chemist. Three years later was promoted to Chief Chemist and Metallurgist. Now in charge of the Chemical and Metallurgical Laboratories and directs research and special investigation into the Chemistry and Metallurgy of steel, steel wire and wire products. Member of the Wire Association, The American Society for Testing Materials, and the American Society for Metals. Awarded the Wire Association Medal for the most meritorious paper on wire manufacture or fabrication during the year 1935, Certificate of Honorable Mention, 1936, the Medal Award for 1937.

it was recommended to the Association that annual regional meetings be held at Pittsburgh and one or two other points each year.

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A TRIBUTE was paid to the memory of **John Mordica,** permanent honorary president, who passed away last July and the action of the board of directors in passing suitable resolutions and having them engrossed and presented to Mr. Mordica's family was approved.

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THE Secretary reported that during the year the office handled approximately 600 inquiries of different kinds and sent out approximately 9,000 pieces of mailing matter.

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IN the Secretary's report, details were presented of the various actions taken at the annual directors meeting held at New York, on March 19, 1937; twelve of fourteen directors being present. At this meeting, **Mr. John C. Callaghan** was appointed chairman of the program committee for the 1937 meeting. It was voted to continue the present registration fee of $5.00 for the annual meetings as heretofore, but that this year one copy of the proceedings would be supplied to each member in attendance upon paying this fee. Further that members could obtain additional copies for $2.50 each, while non-members would be required to pay $5.00 for the proceedings.

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IT was voted that prior to the publication of the proceedings, each member should receive a transcript of his remarks for editing and should be given ten days in which to return this to the chairman of the publication committee prior to the publication of the proceedings. In the event of his failure to so return an edited copy, the committee of publication was then authorized to assume that the remarks were correct as quoted.

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IT was decided that the Medal Award should be made at the annual meeting during Convention week.

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IT was decided to hold an annual smoker dinner (stag) and a committee consisting of Mr. Zapp and Mr. Hamaker was appointed to conduct this activity.

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IN connection with the annual Convention it was decided to have one day devoted to non-ferrous activities, and for this purpose to hold simultaneous sessions with the steel group.

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IT was unanimously voted to re-elect the present officers of the Association for the year 1937-1938, and accordingly the Secretary was instructed to cast one ballot for the following:

President—R. K. Clifford
Vice-President—F. A. Westphal
Vice-President—E. W. Clark
Secretary—Richard E. Brown

✦ ✦ ✦

IN connection with the election of officers, some questions were asked by the new members as to how the society functioned in this connection. Reference to the By-Laws answered this question. These provide the president shall select a Nominating Committee who shall submit the nominations for officers to the board of directors at the March Meeting. The directors then elect the officers for ensuing year. None of the officers need be directors. They can be elected from among the membership. This is covered in the Constitution and By-Laws included in the Annual 1937 Year Book of the Wire Association, a copy of which is in the possession of each member.

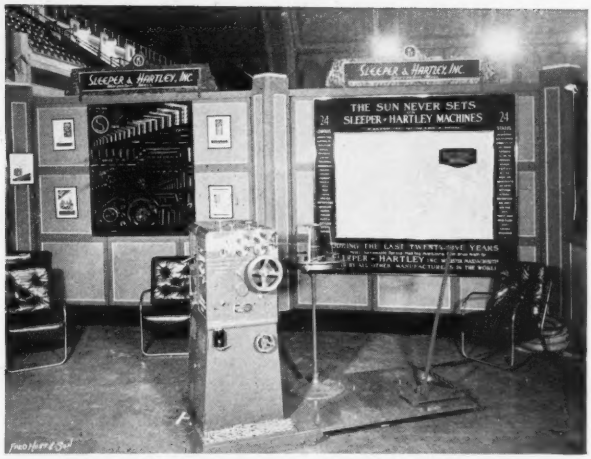
✦ ✦ ✦

ON motion duly made and seconded the report was ordered approved and accepted as read. It

Annual Smoker of The Wire Association, Ambassador Hotel, Atlantic City, N. J., October 20, 1937. ✦ ✦ ✦ ✦ ✦

Syncro Machine Co.

Fine wire insulating machines and the Syncro gearless flyer serving machine, both in operation.



Sleeper & Hartley, Inc.

Exhibiting, in operation, an improved selective type coiler known as the "three-in-one" machine.

Vanadium Alloys Steel Company.

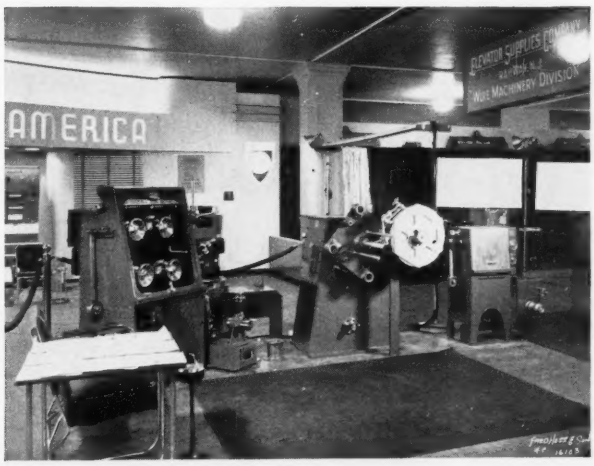
A display of tantalum carbide wire drawing dies.

Norton Company.

A variety of abrasive products used by industry.

Electric Furnace Co.

New developments in special atmosphere equipment for copper brazing, etc.



Elevator Supplies Co., Inc.

ES coarse and fine wire drawing machines in operation.

will be printed in full in the 1938 Year Book of the Association.

✦ ✦ ✦

Election of Directors

UNDER the heading of new business a discussion occurred as to the method of electing directors and an amendment was made to the By-Laws so that they would be in exact conformity with the method of electing directors decided upon; that is, to have all members vote on this subject instead of only those who attended the annual meeting. To accomplish this, it is necessary to conduct this activity by mail.

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Cold Heading and Non-Ferrous Divisions

AT the 1936 Meeting it was decided to undertake the formation of a division devoted to cold heading and cold working of metals and also a division devoted to non-ferrous activities. It was reported that the organization of these divisions is proceeding very satisfactorily. The Association has about 60 members interested in the cold working section, and about 55 in the non-ferrous division, at this time. Plans are being made to proceed with these activities and it is hoped that during the year 1938 the Association will be able to present technical research in these subjects through the medium of "WIRE & WIRE PRODUCTS".

Mr. Clifford to Retire as President At End of Term

AT the conclusion of the business meeting, Mr. Clifford stated that at the end of his term of office he expected to retire as president of the Association, as he felt that it would increase interest of the members of the Association to not only have a rotating board of directors but new officers every second or third year.

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Medal Award

IN awarding the Annual Wire Association Medal, **Mr. John C. Callaghan,** chairman of the Program Committee, made the following comments.

"BEFORE making the presentation of the Wire Association Medal, I might say that to the members of the Board of Directors and to those on the Program Committee has been assigned the task of getting a cross-section of opinion sufficiently broad to present to you three names that we feel merit some recognition from this Association.

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TODAY, we come here at the end of a very fine program that has been prepared and presented by you gentlemen who have given a lot of thought and work to it. And as Chairman of the Program Committee I want to thank you and those Chairmen who have done their part in making this such a fine convention.

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IN this Association we make our friendships here. We carry away rich memories of those friendships and the contacts that in the future make for the interchange of ideas that will improve and help us all. And I think it is our task to jealously guard the richness of those friendships that most of us have only one opportunity a year of cultivating.

✦ ✦ ✦

AFTER summing up the opinions this year of a reasonably large number of individuals and tabulating the results and characterizing them so that we could get a sequence of opinion, the Award has again been given to Mr. B. L. McCarthy.

✦ ✦ ✦

I AM going to qualify that, to some extent, while not attempting to take away from Mr. McCarthy any of the credit that is due him, and say that while perhaps this year his paper may not have carried the originality or the new viewpoints that some might say are necessary in our Association, yet he has given a richness of thinking to us. He has carried out a sequence that all of us can reasonably well follow. Some may say that it is "old stuff". But anyone who says that must be careful that he is still alive and interested in life and interested in the youth that is coming on. So I want to say that even if some of your stuff is old, Mr. McCarthy, it still retains a certain amount of richness for the present.

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THE Shield is not here for presentation today, but it will be forwarded in due time. And it is with pleasure that the Wire Association presents MR. McCARTHY with that Award.

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THE second phase of our problem is concerned with two Honorable Mentions. And it was very interesting to see the way the minds of the members worked in picking out the value of the different papers. And from the way the opinions came in, it showed that those who gave their opinions had given a lot of thought and consideration to their opinions. The result was that Mr. R. W. Sandelin was given the first Honorable Mention. The second Honorable Mention was given to Mr. Allan B. Dove.

(Please turn to Page 727)

✦ ✦ Carboloy Company, Inc. ✦ ✦
Carboloy dies and tools. Demonstrations in the method of torch brazing and grinding Carboloy tools. ✦ ✦ ✦ ✦

✦ ✦ The Torrington Manufacturing Company ✦ ✦
An entirely new line of spring making equipment complete with spring coiler and winding machines. ✦ ✦ ✦ ✦

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in August, 1937 and August, 1936
(In Gross Tons)

	Aug. 1937	July 1937	Aug. 1936
Wire rods	7,858	3,775	2,533
Strip steel	7,703	8,411	4,906
Plain, black or galvanized iron or steel wire	6,098	7,575	3,264
Barbed wire and woven wire fencing	4,092	2,789	2,576
Woven wire screen cloth	101	219	65
Wire rope	1,119	599	.....
Insulated iron or steel wire and cable—see analysis below:			
Other wire and manufactures	748	774	444
Wire nails	398	1,760	431
Tacks	37	67	34
Other nails, including staples	261	173	212
Bolts, machine screws, nuts, rivets and washers	731	969	492
Total, these 11 classifications	29,146	27,111	14,95[illegible]

Imports of Iron and Steel Into the United States
(In Gross Tons)

Concrete reinforcement bars	58	95	1,012
Hollow bar and drill steel	238	146	196
Wire rods	1,475	1,045	1,722
Barbed wire	1,781	1,767	1,038
Round iron and steel wire	493	239	530
Telephone and telegraph wire	4	2	1
Flat wire and strip steel	307	281	283
Other wire	79	380	180
Nails, tacks and staples	1,368	1,827	1,818
Bolts, nuts and rivets	109	94	94
Totals, these 10 classifications	5,912	5,876	5,874

Exports of Insulated Wire and Cable, August, 1937

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	76,618	$ 34,335	957	$ 162
Rubber-covered wire	609,804	173,380	109,024	31,386
Copper weatherproof wire	126,418	24,905	29,078	6,239
Copper telephone cable	12,843	4,725	54,366	5,620
Other insulated copper wire	383,287	115,744	172,865	33,049
Nickel-chrome electric resistance wire	15,723	33,049	15,723	23,980
Total, these 6 classifications	1,224,688	$386,138	382,013	$100,436

Exports Decline

AUGUST shipments recorded declines in 37 individual products when compared with the July totals, with offsetting increases in 28. The outstanding decline (54,503 tons) was recorded in pig iron exports, followed by those in plain shapes (5,743), tin plate (5,269), skelp (4,902), steel bars (4,294), and black steel sheets (4,069). The most prominent increase (22,983 tons) resulted in ingots, blooms, etc., others of moment being in plate (4,628), wire rods (4,083), and barbed wire (1,401).

✦ ✦ ✦

Japan Leading Individual Market

JAPANESE purchases in August amounted to 159,109 tons, thereby maintaining their predominating position in this trade. The principal products moving to Japan were ingots, blooms, etc., (62,878), pig iron (56,610), plate (22,380), steel bars (4,683), plain shapes (2,733), tin plate (2,574), wire rods (2,523), and black steel sheets (1,505). Canadian purchases (43,970 tons) covered a wide range of products, those outstanding being black steel sheets (8,542), skelp (6,522), plate (6,165), plain shapes (5,514), hot-rolled strip steel (2,426), steel bars (2,317), wire rods (2,239), and tin plate (1,824). Shipments to the United Kingdom (46,301 tons) were chiefly pig iron (38,613), ingots, blooms, etc., (1,663), wire rods (1,378), steel bars (1,092), and hot-rolled strip steel (603). China took 21,226 tons of principally plate (5,296), tin plate (3,272), plain shapes (2,657), black steel sheets (2,306), steel bars (1,987), and barbed wire (1,218). Mexico ranked fifth with a 13,173-ton trade of mostly ingots, blooms, etc., (3,084), black steel sheets (2,802), rails (1,962), and galvanized steel sheets (545). France's purchases (10,729 tons) were confined principally to pig iron (10,000). Brazil took 8,421 tons of chiefly black steel sheets (1,298), plate (1,954), tin plate (1,924), galvanized steel sheets (545), and plain wire (478).

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Far East Maintains Leading Position

RECEIVING a total of 206,853 tons of iron and steel products (excluding scrap) from the United States in August, the Far East accounted for 50.7 percent of all shipments from the United States in that month against a proportion of 46.7 percent in July. Europe, next in importance, took 85,323 tons or 20.9 percent (25.9 percent), followed by North and Central America and the West Indies with 68,346 tons or 16.8 percent (20.4 percent). South America ranked next with 32,140 tons or 7.9 percent (8.3 percent), followed by Africa which accounted for 15,261 tons or 3.7 percent (3.9 percent).

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Import Value Rises Although Volume Lower

AUGUST imports of iron and steel products (excluding scrap) totaled 38,379 tons in comparison with 41,388 tons in the preceding month and 48,170 tons in the corresponding one of 1936 in recording respective declines of 6.8 percent and 20.3 percent. Despite the lower volume in August, the value at $2,543,241 compared with $2,084,401 in July and $2,092,517 in August 1936—increases of 22.0 percent and 21.5 percent, respectively. A heavy rise in steel pipe imports contributed chiefly to the sharp value rise.

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STEEL pipe imports expanded sharply to 11,185 tons and came mostly from Germany (10,296), Sweden (375), and Canada

(*Please turn to Page 726*)

Exports and Imports of Wire

(*Continued from Page 725*)

(250). Pig iron (7,952 tons), was imported chiefly from British India (5,167), and the Netherlands (2,202). Structural shapes (4,150 tons were taken principally from Belgium (3,328) and France (803). Solid and hollow bars (2,894 tons) were received chiefly from Belgium (1,278), Sweden (646), and France (632). Hoops and bands (1,784 tons) came principally from Belgium (1,386), while the bulk of barbed wire trade (1,781 tons) was divided between Germany (1,494) and Belgium (189).

✦ ✦ ✦

Germany Assumes Leading Position In August Trade

GERMANY was the outstanding supplier of iron and steel products (excluding scrap) in August with a total of 14,368 tons made up chiefly by pipe (10,296), barbed wire (1,494), nails, tacks, and staples (1,228), sheet piling (399), and solid and hollow bars (304). Belgium had a 6,696-ton share of mostly shapes (3,328), solid and hollow bars (1,278), hoops and bands (1,386). British India's total (5,167 tons) was all of pig iron. Sweden sent in 3,748 tons of chiefly wire rods (1,323), solid and hollow bars (646), round iron and steel wire (378), pipe (375), flat wire and steel strips (261), and hollow bar and drill steel (238). France's trade totaled 3.049 tons in which the predominating items were spiegeleisen (1,046), shapes (803), solid and hollow bars (632), and hoops and bands (322). The Netherlands accounted for 2,325 tons in which pig iron (2,202), was outstanding.

✦ ✦ ✦

CARD CLOTHING receipts amounted to 23,534 square feet valued at $35,239 in comparison with 40,413 square feet valued at $58,605 and came from the United Kingdom (19,940 square feet and $28,451), Germany (2,991 square feet and $5,583), and Belgium (603 square feet and $1,205).

IMPORTS of WIRE HEDDLES at 415,000 pieces compared with 1,628,000 pieces and were received from Belgium (315,000), and Germany (100,000).

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OF the galvanized before weaving grade of WIRE FENCING AND NETTING, 175,857 square feet were received from the Netherlands in comparison with a trade of 45,000 square feet in July. Of the galvanized after weaving grade, the total was 2,620,952 square feet against 1,614,800 square feet, with Belgium (1,865,087), Germany (417,450), and the Netherlands (334,515) the outstanding sources.

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RECEIPTS of WIRE CLOTH AND SCREEN totaled 152,530 square feet against 102,359 square feet and came principally from Belgium (90,000), Germany (31,333), and Canada (13,447).

✦ ✦ ✦

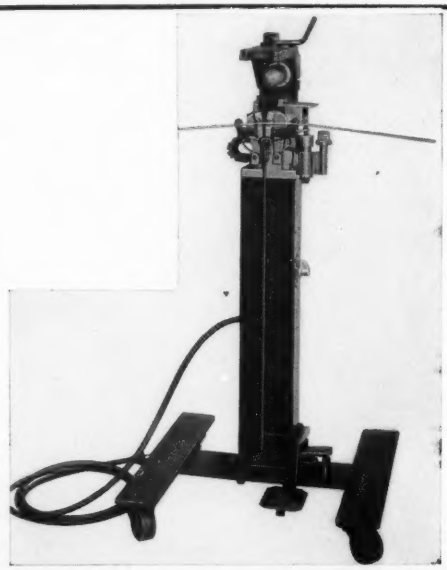
THE trade in FOURDRINIER AND OTHER PAPER-MAKING WIRES totaled 50,097 square feet against 80,666 square feet and

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO, ILL.
Telephone State 7468 General Office and Factory, Peoria, Ills.

was accounted for by mostly Germany (31,983), and Austria (14,514).

✦ ✦ ✦

EXPORTS of iron and steel wood screws during August, 1937 totaled 45,884 gross valued at $6,215. Of this total Mexico took 30,045 gross valued at $3,286; Cuba 5,935 gross valued at $997; Salvador 2,383 gross valued at $380; Argentina 1,503 gross valued at $282; Colombia 1,250 gross valued at $174; Costa Rica 1,019 gross valued at $151.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 6,603 gross valued at $4,290. Of this total Cuba took 1,823 gross valued at $511; Panama 1,496 gross valued at $786; France 980 gross.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 109,409 gross valued at $10,496. Of this total Belgium supplied 80,500 gross valued at $8,255; Japan 22,264 gross valued at $1,541; Germany 6,645 gross valued at $700.

Wire Association Convention

(Continued from Page 724)

PRESIDENT CLIFFORD then called on Mr. McCarthy who said:

"NEEDLESS to say, gentlemen, I more than appreciate this honor that you have bestowed upon me. I appreciated it in 1935, and it has probably been the greatest help to me of any other thing I have ever obtained.

✦ ✦ ✦

"WHILE I have been the lucky one in receiving the Award, there is one thing which you must remember as tending to influence the votes of the Committee, and which I had not thought of and did not direct my efforts that way. But you must remember that the popularity of one's subject sometimes plays a very important part in determining which way some of them vote. If a man likes it, he will vote for it.

✦ ✦ ✦

"I have read over all of the papers this year, and every one of them is exceptional. I feel that some of them are—shall I say—better than mine, in my opinion. My paper was not presented with any intention of competing with anybody else for the Award. I hadn't thought of that. I thought that my days of obtaining awards in the Wire Association were over. While Mr. Callaghan may feel that he and I should retire together, I figure that he has a few years on me. And I personally hope that it will be a long time before I ever retire from active work or help in the Wire Association.

"NEVERTHELESS, I want you all to know that as far as I am concerned, personally, I will not compete for any more prizes. Sometimes the equipment and the time and the help available in one laboratory may make it rather easy for a person to do things that somebody else cannot do. I would like to continue to help the Wire Association. I would like to continue from time to time with some of these publications. But under no conditions will I ever consider any of my work to be in line for the Award. I feel that other fellows should have the opportunity, the same as I have had it."

✦ ✦ ✦

The Technical Sessions

LACK of time and space prevents a discussion of the technical sessions here. A review will be published in the December issue of WIRE & WIRE PRODUCTS. The full discussions are published separately in the form of typed minutes and all who registered at the meetings will in due course receive a copy.

✦ ✦ ✦

Annual Dinner

WEDNESDAY night was the occasion of the annual Wire Association Dinner. This year it was a stag smoker under the direc-

(Please turn to Page 732)

GLADER WIRE NAIL MACHINERY

The Glader Nail Machine of to-day is the result of forty years experience in the building of wire nail machines.

High production and low upkeep cost are facts proven in actual mill practice. All recent major nail machine installations have been Glader machines exclusively.

Machines are built in ten different sizes, covering a range of nails from No. 22 wire ¼" long, to ⅜" diameter wire 12" long, including our Single-Blow roofing nail machine.

Write for our catalogue and make your own comparison of our guaranteed production figures with what your present equipment is producing.

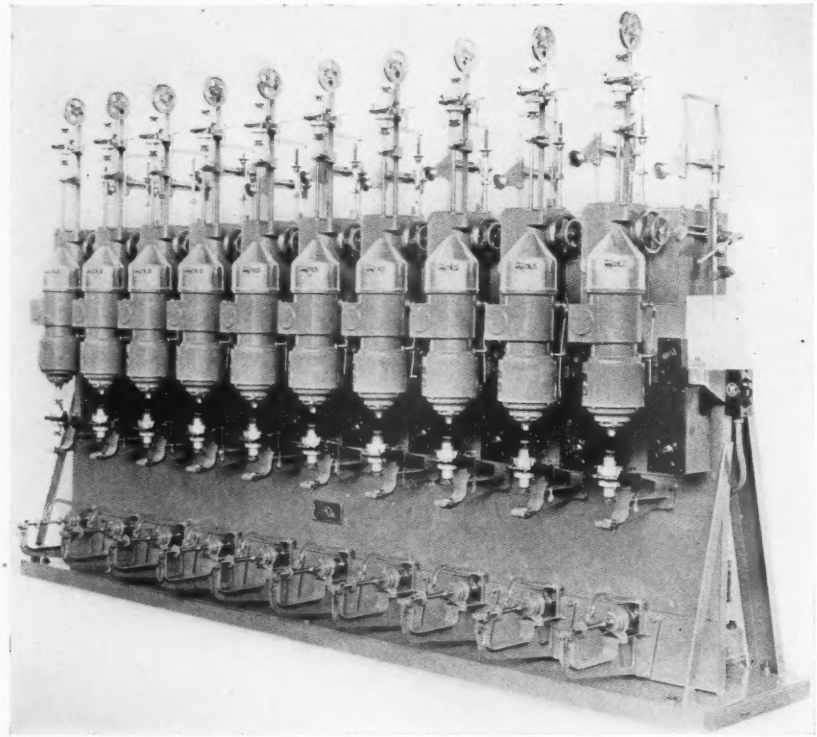
FOR FURTHER INFORMATION ADDRESS—

WM. GLADER MACHINE WORKS

210 N. RACINE AVENUE

CHICAGO, ILLINOIS.

SYNCRO



SYNCRO Fine Wire Insulating Machines

Featuring . . . direct motor driven flyers . . . individual control . . . complete flexibility . . . in fact all the advantages inherent in all models of Syncro Serving Machines.

SYNCRO MACHINE COMPANY

187 SYLVAN AVE. NEWARK, N. J.

SYNCRO INSULATING MACHINES

ACCURATE FAST ECONOMICAL EFFICIENT

A Review of Recent Wire Patents

No. 2,092,477, CONDUCTOR INSULATED WITH CELLULOSE MATERIAL, Patented September 7, 1937, by Thomas R. Scott and Malcolm C. Field, London, England, assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

About the wire conductor is a layer of paper, the paper consisting of cellulose fibers which have been converted into partial ethers without materially affecting their mechanical structure.

✦ ✦ ✦

No. 2,092,636, INSULATED COPPER WIRE, Patented September 7, 1937, by Jacob R. Brossman, Yeadon, Pa., assignor to General Electric Company, a corporation of New York.

This wire conductor has a copper oxide coating with an outer coating consisting of a fused mixture of sodium perborate and barium carbonate.

✦ ✦ ✦

No. 2.092,647, GLASS INSULATED UNDERGROUND ELECTRIC CABLE, Patented September 7, 1937, by Henry M. Hobart, Niskayuna, N. Y., assignor to General Electric Company, a corporation of New York.

Disposed about the wire cable is a metallic sheath and, extending about this sheath, is a thick wall of glass in sections, fused glass being employed for uniting the ends of each section.

✦ ✦ ✦

No. 2.092,840, STRAND STRAIGHTENER, Patented September 14, 1937, by Guy Gilbert Greene, San Francisco, Calif., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

The structure includes at least three paralleling wire straightening rolls, the first being fixedly mounted and the last being mounted for adjustment respecting the traveling direction of the wire strand to be straightened, links interconnecting the three rolls so that their respective strand contacting peripheries are spaced distances equaling the diameter of the strand.

✦ ✦ ✦

No. 2,093,087, INSULATED CONDUCTOR, Patented September 14, 1937, by Alger M. Lynn, Oak Park, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The wire conductor is provided with a band of untwisted artificial filaments of a cellulose derivative, helically wrapped around the wires, these filaments being ununited and are heat-treated to remove internal strains.

✦ ✦ ✦

No. 2,093,114, ELECTRIC CABLE AND METHOD OF INSTALLATION, Patented September 14, 1937, by Hugo Sonnenfeld, Bratislava, Czechoslovakia, assignor to General Cable Corporation, New York, N. Y., a corporation of N. J.

A power cable system is contemplated, with an expansible sheath surrounding the wire conductor and a fluid under pressure between the conductor and the sheath so that the sheath will be maintained in an expanded condition, this expansion being sufficient to cause the

sheath to contact the inner face of the outer, pressure-resisting tube which forms the exterior portion of the cable.

✦ ✦ ✦

No. 2,093,171, TAPPING SCREW, Patented September 14, 1937, by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

A portion of the thread at the entering end only of the screw gradually decreases in height. The screw's cutting edge, at the entering end of the screw, is positioned out of circumferential alignment with the portion of the body positioned medially in advance of this edge. With this construction, the cutting effectiveness is increased when the screw is initially applied to the work.

✦ ✦ ✦

No. 2,093,172, TAPPING SCREW, Patented September 14, 1937, by Carl G. Olson, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

In this construction, a hardened tapping portion is provided, this portion being longitudinally recessed providing a cutting edge, with this edge terminating short of the head. As the thread on the tapping portion gradually decreases in crest diameter towards the entering end, so as to facilitate its initial application to an aperture which is unthreaded.

✦ ✦ ✦

No. 2,093,173, WIRE FORMING MACHINE, Patented September 14, 1937, by Mauritz Olson, Bridgeport, and Richard A. Johnson, Fairfield, Conn., assignors to The A. H. Nilson Machine Company, Bridgeport, Conn., a corporation of Conn.

The construction includes a hook forming device for providing a hook upon one end of the wire end for bending the wire around a form, whereupon the end portions of the wire are united.

✦ ✦ ✦

No. 2,093,238, PLATING OF WIRE, Patented September 14, 1937, by Elgin Carleton Domm, Niles, Mich., assignor to National Standard Company, Niles, Mich., a corporation of Michigan.

A plating of steel wire is contemplated, the wire being passed through molten zinc and raised to a relatively high temperature, after which the zinc coating is quenched without greatly lowering the temperature of the wire itself. The zinc plated wire is then passed thru a hot water bath in which copper cyanide has been introduced, an electric current being passed thru the bath, which clears impurities from the wire and it is then copper plated.

✦ ✦ ✦

No. 2,093,411, PROTECTIVE COATING AND SHEATHING FOR CABLES, PIPES, AND THE LIKE, Patented September 21, 1937, by Edward Bowden, London, and Donal O'Duffy, Middlesex, England, assignors to The Enfield Cable Works Limited, London, England, a British company.

An object of the invention is to provide a continuous, corrosion resistant sheath to wires and the method consists in applying a wrapping in tape form of rubber compound which is unvulcanized and does not contain vulcanizing ingredients. In direct contact with this covering is then placed a fibrous reinforced sheathing of oil-containing bituminous material, so that the rubber is permanently softened by migration of the oily constituents of the sheathing.

✦ ✦ ✦

No. 2,093,445, ELECTRIC CABLE, Patented September 21, 1937, by Philip Vassar Hunter, London, England, assignor to Callender's Cable and Construction Company Limited, London, England, a British company.

Included in the steps is one for removing insulating liquids unabsorbed by the laminated, liquid impregnated paper sheath surrounding the wire, after which the sheath is impregnated with a relatively viscous insulating liquid.

✦ ✦ ✦

No. 2.093,501, ELECTRICAL CONDUCTOR, Patented September 21, 1936, by Ira Williams, Woodstown, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

This wire conductor is covered with a composition comprising a polymer of a hydro-halogen addition product of monovinylacetylene.

✦ ✦ ✦

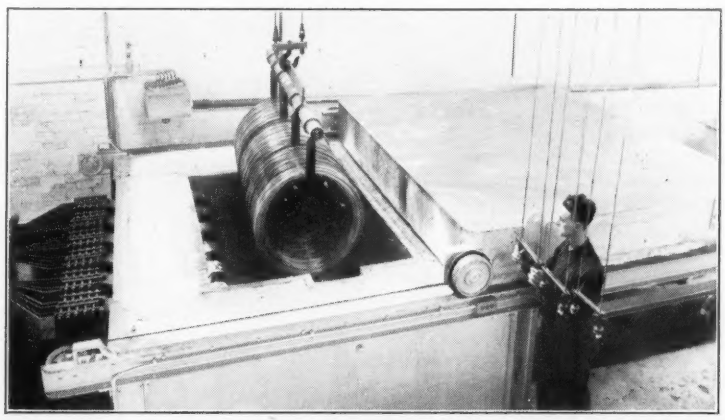
No. 2,093,531, SPRING COVERING APPARATUS, Patented September 21, 1937, by Alexander F. Werner, Detroit, Mich., assignor to The Murray Corporation of America, a corporation of Delaware.

(*Please Turn to Page 741*)

LAVITE ANNEALING

GIVES — more uniform product - - controlled atmosphere - - greater output - - lower cost - - better surface - - better shop conditions - - eliminates pickle - - eliminates burned out pots - - no excess heat; no dirt; no smoke.

RESULTS — of years of development of materials, processes and equipment as covered by our patents of many new and exclusive features.



LAVITE ANNEALING FURNACE—1000°—2000° F.

THE BELLIS HEAT TREATING CO.
Branford
Connecticut

and

LAVITE LIMITED,
Low Moor, Bradford
Yorks, England

WIRE

To consider your special needs and problems in wire, all the skill and experience of our metallurgists are at your command. Perhaps—as has happened with many manufacturers—they can point the way to faster work, fewer rejections, lower costs, and a better, more dependable product. As specialists in low-carbon wire we often can furnish a combination of analysis and temper that simplifies fabrication and improves strength in the final product.

Besides special-analysis and copper-bearing steel wire Continental — and only Continental—offers wire of Konik, the patented new steel containing copper, nickel, and chromium. Konik's amazing amenability to carburizing and heat-treatment permits new peaks of hardness, toughness, and resistance to abrasion. Its economies have been proved in four years of use by a variety of manufacturers.

Among the finishes offered by Continental are bright, bright and black annealed; sull-coated; processed; galvanized, including Flame-Sealed; liquored, coppered and tinned in many modifications. Eight shapes are standard, and many specials available. Regular gauges run from No. 34 to ⅝ inch. Furnished in coils of suitable sizes, or cut and straightened to specification.

CONTINENTAL STEEL CORPORATION

General Offices: Kokomo, Indiana • Plants at Canton, Kokomo, Indianapolis

CONTINENTAL

STEEL SHEETS AND WIRE PRODUCTS

Wire: Bright Basic, Annealed, *Konik, Special Manufacturers, Galvanized, *Flame-Sealed

Wire Rods, Nails, Staples, Bale Ties, Barbed Wire; Fence — 15 Types; Gates and Fittings

Sheets: Black, Galvanized, Special Coated; Roofing and Siding—14 Styles

*Trade Mark Registered, U. S. Patent Office

'Round the World with the Wire Industry

German Notes

IN July Germany exported 21,147 tons of wires of all kinds and 8,376 tons of other wire products including wire nails. July export figures for bars, plates and sheets were all time record figures.

✦ ✦ ✦

PRODUCTION of wire rods were 97,504 tons in July; 90,052 tons in June and advanced to 98,826 tons in August. This production figure is however absolutely insufficient to the existing demand. Almost all wire products, particularly wire netting, have to be rationed, because of the very heavy domestic demand for all wire products from all consumers. Wood screws are also in great demand and shipment dates are up to fourteen weeks. The Far Eastern events have had an influence on the export markets. Barbed wire sales are good, but otherwise business has been slack, as many shipments on their way to places in the War areas, particularly Shanghai, were sold to other markets. No change of prices occurred but rates are higher to all Far Eastern markets including the Philippines. American imports are maintained on the basis of the past months, but American export competition is reported to be keeping pace with the decline of Japanese exports. The chief advantage of the American competitors over their European competitors is that they give a comparatively prompt shipment date as late future dates for the European industry are still necessary.

✦ ✦ ✦

NOW that all French cable and electric wire producers are united in one cartel, it is hoped that an understanding will be possible in regard to the competition in foreign markets. A mutual market protection agreement already exists. Prices on electric cable and wire for export have again advanced. The British industry has heavy orders and therefore more business is being booked from British colonies.

German Export Prices

THE German wire rod cartel has notified exporters that the same quantities will be available for export as in June, July and August, that is, approximately 5,600 tons monthly. The orders coming in exceed this amount considerably so that the bulk has to be turned down. The percentage of orders for open hearth steel wire rods, as well as for thick rods, has increased. Extras for open hearth steel are now 12/6 shillings (gold) and for thick rods up to 15 shillings per ton.

✦ ✦ ✦

PRICES for wire rope exports have again advanced. The increases on ropes of small sizes (up to 2″ circumference) were 1 shilling 12/6-17/6; for thicker ropes 1.0 to 1.5.0 per ton to all markets. The United States continues to buy fair quantities, mainly of thin ropes in Germany.

✦ ✦ ✦

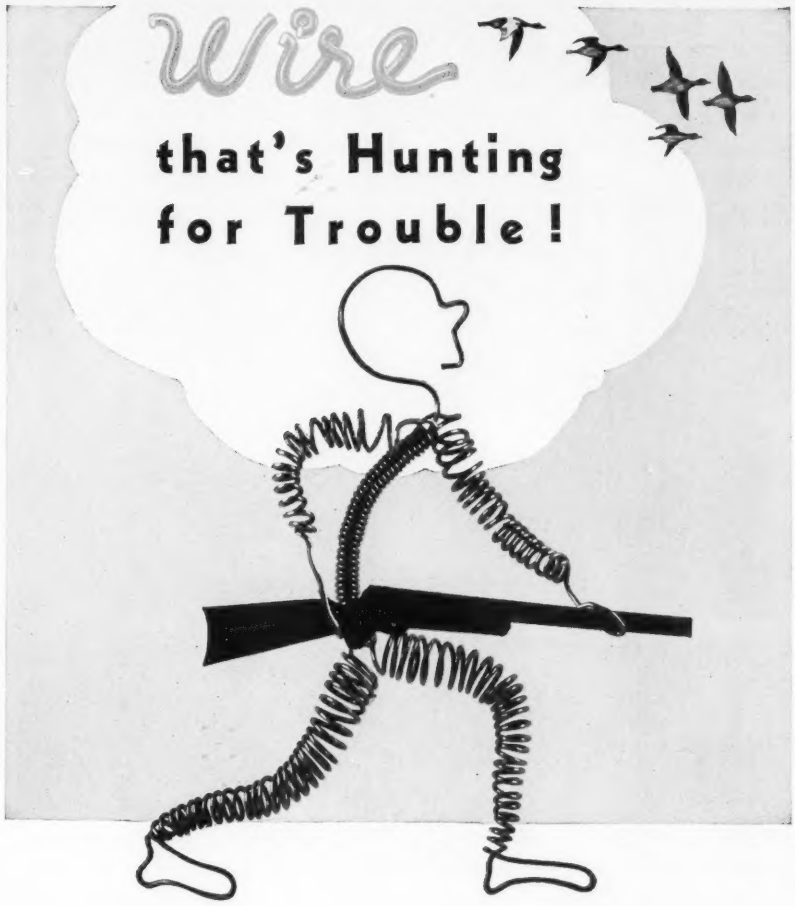
THE German and particularly the Austrian makers of thin wire for wire mesh (G 30-46) have almost completely ceased to supply the British mesh industry, which depends upon its continental source of supply. Because the Continental wire mesh makers are buying so heavily, there is little available for export and consequently the British makers are suffering a shortage of this important raw material.

✦ ✦ ✦

Dominion Steel & Coal Corp.

THE Dominion Steel & Coal Corporation, Ltd., have purchased all interests of the United States Steel Corporation located in the Windsor District, consisting of Canadian Bridge Co., Essex Terminal Railway, Canada Steel & Wire Co., and the Canada Steel Lands, and the holding company known as the Canadian Steel Corporation. All these plants will be operated by the Dominion Steel & Coal Corporation under the management of **F. G. Kester,** as General Manager. Mr. Kester was formerly connected with the United States Steel Corp.

(*Please turn to Page 732*)



Looking for tough jobs and "impossible" specifications . . . that's Keystone wire! Our technical staff has listened to the woes of many a production manager . . . and then developed a wire that worked like a charm. Of course, we like to supply the easier orders too . . . and even if you don't have a troublesome problem to give us, you'll like the perfect uniformity of all Keystone wire. Have you anything for us to shoot at?

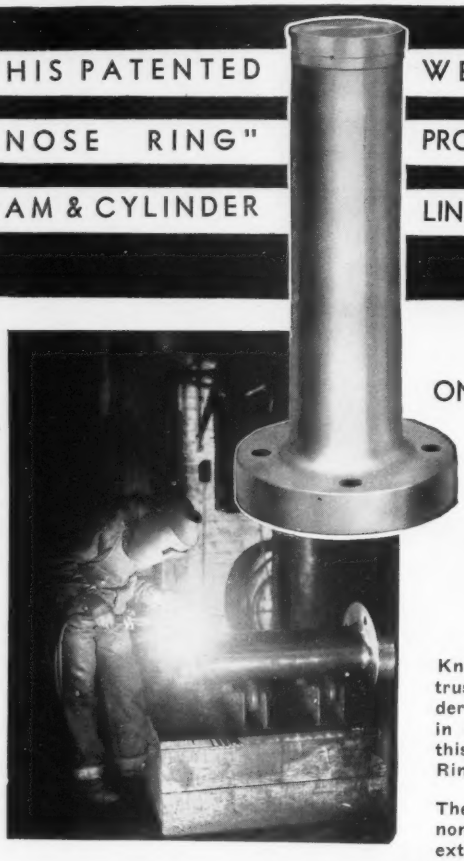
KEYSTONE
STEEL & WIRE CO., Dept. W, PEORIA, ILL.

HIGH CARBON
or
LOW CARBON

SAMSON SPRING WIRE
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright . . . Tinned
Coppered
Annealed
Galvanized

THIS PATENTED "NOSE RING" RAM & CYLINDER



WELDED MONEL PROTECTS EXTRUSION LINING . . . . . .

ON ALL

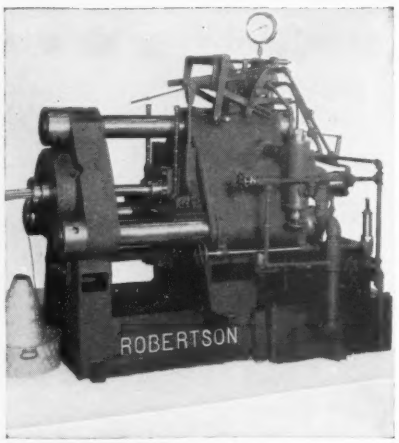
ROBERTSON EXTRUSION PRESSES

Knowing the tendency of extrusion ram and extrusion cylinder lining to become damaged in use, ROBERTSON developed this welded, Monel Metal Nose Ring to minimize the difficulty.

The Monel Metal produces a non-ferrous bearing between the extrusion ram and the extrusion cylinder bushing which will not cut or score the cylinder.

It is due to the special manner in which this is applied that it is possible for this reasonably soft metal to withstand the high extrusion pressures used and, at the same time, do its work as a non-ferrous, anti-friction bearing between the steel surfaces.

This—but one of the many exclusive features of Robertson Extrusion Presses—is indicative of the extra value you get for your money. Full information—yours without obligation.



Illustrations at top of page: the protective Monel Metal "nose ring"; welding a "nose ring" in Robertson shops.

Lower illustration: Extrusion Press complete. Extrudes 8 strands of lead wire, yet occupies a floor space of but 4′ x 6′.

Robertson Products include: Lead Encasing Presses for Rods, Wire, Electric Cables and Rubber Hose. Extrusion Presses for Lead Pipe, Solder, Traps, Lead Wire, and Non-ferrous Alloys. Also, High Pressure Pumps, Hydro-Pneumatic Accumulators, Lead Melting Furnaces and Pots, Dies, Cores, etc.

John ROBERTSON CO. INC. Pioneers-Since 1858

125-137 Water Street Brooklyn, N. Y.

Wire Association Convention

(*Continued from Page 727*)

tion of an entertainment committee consisting of Mr. **R. L. Hamaker,** The Warner Company, and Mr. **A. R. Zapp** of Firth-Sterling Steel Company. The floor show was brought down from New York and was thoroughly enjoyed by all present. The dinner was attended by about 200 and was voted to be a great success. It is expected that next year the same type of dinner will be given.

✦ ✦ ✦

Among the Exhibitors at The National Metal Exposition

THIS year's National Metal Exposition was by far the best ever held both from the standpoint of the number of exhibitors and the attractiveness with which the exhibits were presented.

✦ Morrison Engineering Co., Inc. ✦
A new type Morrison "Flash-Baker" for baking wire rods, together with a welding rod drying unit for baking flux coated welding rods—both in operation. ✦ ✦ ✦

OPERATING exhibits were varied and created a great deal of interest. While the attendance was limited to the members of the various participating societies and their guests, it is interesting to note that up to 4 o'clock on Friday afternoon of the Show, there were 10,870 registrations. The exhibitors expressed themselves as being well pleased as those registering were primarily technical and professional men qualified to ap-

preciate the value of these exhibits.

✦ ✦ ✦

THE Show this year may be said to be the largest and most successful up to date and **"Bill" Eisenman,** Secretary of the American Society for Metals, and his assistants should be congratulated on the smoothness with which they handled it.

✦ ✦ ✦

IT was announced that the 1938 Wire Association Meeting together with the National Metal Congress would be held at Detroit, Mich., the week starting October 17.

✦ ✦ ✦

Registration for the Technical Meetings

AKIN, W. M., Vice President,
Laclede Steel Co.,
St. Louis, Mo.

ANJESKEY, A. F., Sales Mgr.,
Cleveland Tramrail Div. of
Cleveland Crane & Engrg. Co.,
Wickliffe, Ohio.

ATKINSON, LAWRENCE, Works Mgr.,
Frost Steel & Wire Co., Ltd.,
Hamilton, Ontario, Canada.

BARNINGHAM, CHAS. S., Sales Mgr.,
New England Butt Co.,
Providence, R. I.

BARTHLEMESS, J. F., Prop. Mgr.,
National Lock Washer Co.,
Milwaukee, Wis.

BASSETT, WM. H., JR., Manager,
Metallurgical Development,
Anaconda Wire & Cable Co.,
Hastings-On-Hudson, N. Y.

BEAMAN, P. A., Manager,
Wire Machinery Department,
Morgan Construction Co.,
Worcester, Mass.

BEARDSLEE, K. R., Gen. Sales Mgr.,
Carboloy Company, Inc.,
Detroit, Mich.

BECKER, S. J., Research Engr.,
Wm. Gibson Company,
Chicago, Ill.

BEESON, J. K., Asst. Mgr. Sales,
Pittsburgh Steel Co.,
Pittsburgh, Pa.

BILLERBECK, WM. J., Engineer,
American Insulating Mach'y. Co.,
Philadelphia, Pa.

BLESCH, CHAS. A., Industrial Furnace Engr.,
Natural Gas Equipment Co.,
San Francisco, Cal.

BLOUNT, WM. H., Treasurer,
Sleeper & Hartley, Inc.,
Worcester, Mass.

BOLL, JOHN K., Sales Manager,
Wheeling Steel Corp.,
Wheeling, W. Va.

BOSWIN, GEO. A., Gen. Sales Mgr.,
Reel Department,
Stevens Metal Products Co.,
Niles, Ohio.

BRALEY, S. A.,
Mellon Institute,
Pittsburgh, Pa.

BRERETON, C. F., Metallurgist,
Richard Johnson & Nephew, Ltd.,
Manchester, England.

BRIGHTMAN, H. M., Asst. to President,
Columbia Steel & Shafting Co.,
Carnegie, Pa.

BRODEN, G. A., President,
Broden Construction Co.,
Cleveland, Ohio.

BRONSON, W. D., Salesman,
Carboloy Company, Inc.,
Chicago, Ill.

BROTEN, O. A., Vice President
National Pneumatic Co.,
Chicago, Ill.

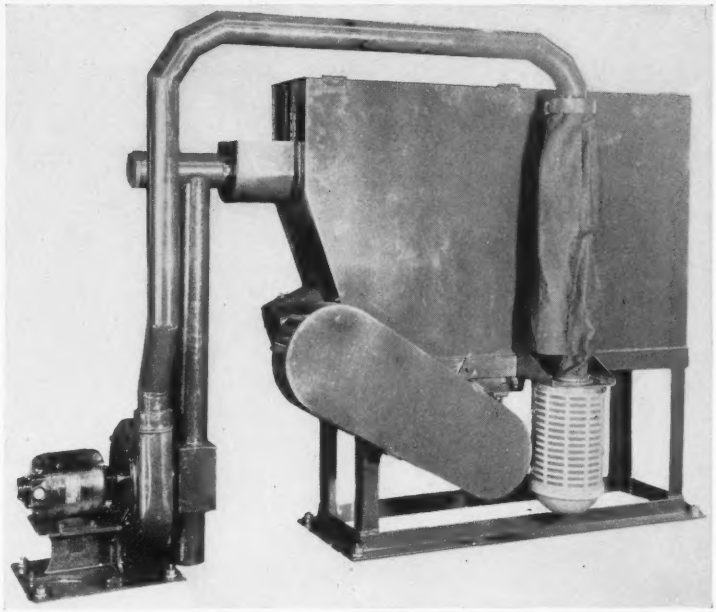
BROWN, HUGH E., Dir. of Research,
W. S. Tyler Company,
Cleveland, Ohio.

BROWN, WM. L., Manager,
Detroit Wire Die Co.,
Detroit, Mich.

(*Please turn to Page 734*)

ES

MICA APPLICATION UNIT



THE MICA APPLICATION UNIT shown above is of the recirculating type, and is arranged to uniformly apply powder flaked mica or similar materials to a wire or cable.

✦ ✦ ✦

A motor driven feeding mechanism continuously and uniformly applies mica to the wire or cable surface. The mica surrounding the cable is under compression.

✦ ✦ ✦

A vacuum system removes all surplus and loose mica from the wire or cable at the point of leaving the Application Unit and retrieves same.

Ask Us About Our High Speed Non-ferrous Wire Drawing Equipment

Saturating and Finishing Equipment For Weatherproof and Code Wire

Take-ups—Spoolers—Coilers

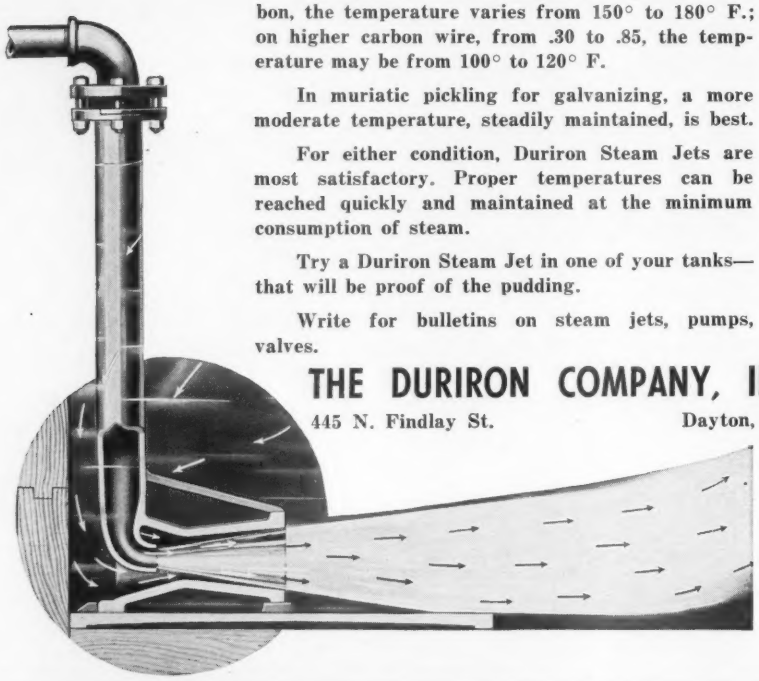
Other Equipment for Producing Wire and Cable

ELEVATOR SUPPLIES COMPANY, Inc.

Executive and Sales Offices
420 Lexington Ave., New York, N. Y.

Works
Rahway, N. J.

To heat – circulate – agitate Pickle Liquor



In sulphuric acid cleaning of rod up to .25 carbon, the temperature varies from 150° to 180° F.; on higher carbon wire, from .30 to .85, the temperature may be from 100° to 120° F.

In muriatic pickling for galvanizing, a more moderate temperature, steadily maintained, is best.

For either condition, Duriron Steam Jets are most satisfactory. Proper temperatures can be reached quickly and maintained at the minimum consumption of steam.

Try a Duriron Steam Jet in one of your tanks—that will be proof of the pudding.

Write for bulletins on steam jets, pumps, valves.

THE DURIRON COMPANY, INC.

445 N. Findlay St. Dayton, Ohio

NORBIDE ABRASIVE . . .

The choice of users of carbide dies for economical shaping, ripping and finishing.

NORTON COMPANY, WORCESTER, MASS.

N-32

NORTON ABRASIVES

Registrations for the Technical Meetings

(Continued from Page 283)

BROWN, RICHARD E., Publisher,
"Wire and Wire Products",
New York, N. Y.

BUCHANAN, D. D., Asst. Gen. Mgr.,
Union Drawn Steel Co.,
Massillon, Ohio.

BUELOW, ALFRED E., Chief Engineer,
Lamson & Sessions Co.,
Cleveland, Ohio.

BURCHFIELD, W. F., Development Engr.,
International Nickel Co.,
New York, N. Y.

BURNHAM, L. H., Electrical Engr.,
General Electric Co.,
Pittsfield, Mass.

CALLAGHAN, J. C., Wks. Mgr.,
Canada Works,
Steel Co. of Canada, Ltd.,
Hamilton, Ontario, Canada.

CARNAHAN, H. B., Asst. Wks. Mgr.,
Canada Wire & Cable Co.,
Toronto, Ontario, Canada.

CHRISTIN, R. E., Metallurgist,
Columbus Bolt Works Co.,
Columbus, Ohio.

CLARK, ARTHUR D., Representative,
Canadian General Electric Co., Ltd.,
Hamilton, Ontario, Canada.

CLARK, E. W., Mechanical Engineer,
Wire and Cable Section,
General Electric Co.,
Schenectady, N. Y.

CLARK, HERBERT B., Vice Pres.,
Union Wire Die Corp.,
Stamford, Conn.

CLIFFORD, RALPH K., Works Mgr.,
Continental Steel Corp.,
Kokomo, Indiana.

COOCH, L. S., Metallurgist,
Buffalo Bolt Company,
North Tonawanda, N. Y.

COPPICK, JOHN C., Manager,
Dominion Steel & Coal Corp.,
Montreal, Quebec, Canada.

CORNELIUS, TAYLOR, Asst. Supt., Wire Mill,
Aluminum Company of Canada, Ltd.,
Shawinigan Fall, Quebec, Canada.

COX, G. L., Research & Development,
International Nickel Co.,
New York, N. Y.

CRAIG, G. L., Res. Engineer,
Calumet & Hecla Cons. Copper Co.,
New York, N. Y.

CRAPO, FRED M., V. P. & Gen. Mgr.,
Indiana Steel & Wire Co.,
Muncie, Indiana.

CRAWFORD, W. H., Manager,
Eaton Manufacturing Co.,
Massillon, Ohio.

CREASY, A. E., Sales Engineer,
Cleveland Tramrail Div. of
Cleveland Crane & Engrg. Co.,
Wickliffe, Ohio.

CREWE, L. C., Gen. Foreman Wire Mill,
Bethlehem Steel Co.,
Sparrows Point, Md.

DAVIS, ALVAN L., Res. Engineer,
Scovill Mfg. Co.,
Waterbury, Conn.

de BRUIN, HARRY W., Vice Pres.,
Jeffrey Manufacturing Co.,
Columbus, Ohio.

DEMPSEY, NELSON W., Metallurgist,
American Steel & Wire Co.,
Worcester, Mass.

DIMLING, PAUL E., Salesman,
Firth-Sterling Steel Co.,
McKeesport, Pa.

DI SANTO, B. J., Mechanical Engr.,
Central Research Laboratory,
American Smelting & Refining Co.,
Maurer, N. J.

DOMES, VIKTOR, Wire Engineer,
Felten & Guilleaume, A.G.,
Bruck A/D Mur, Austria.

DONACHIE, MATTHEW J., Engineer,
Geo. W. Prentiss & Co.,
Holyoke, Mass.

DONOVAN, G. L., Supt. Rod & Wire Mill,
General Cable Corporation,
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MACKAY, W. ROY., Asst. Supt.,
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McCOY, A. W., JR., Salesman, Carboloy Company, Newark, N. J.
McDONALD, D., Asst. Supt., Dominion Steel & Coal Corp., Sydney, N. S., Canada.
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McILVRIED, E. J., Vice Pres., Vaughn Machinery Co., Cuyahoga Falls, Ohio.
McKEAN, JOHN R., Asst. Manager, Kennecott Wire & Cable Co., Phillipsdale, R. I.
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MELVILLE, NORMAN F., Manager, Manufacturers Wire Sales, Pittsburgh Steel Co., Pittsburgh, Pa.
MERRIMAN, T. C., Metallurgist, Seymour Mfg. Co., Seymour, Conn.
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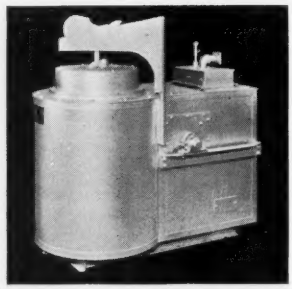

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AT the National Metal Congress it was announced that the Western Metal Congress and Exposition would be held in Los Angeles March 21st to 25th, 1938, and that headquarters would be at the Los Angeles Biltmore Hotel. It was also announced that the Western Metal Exposition held in connection with the Congress, would be housed in the Pan-American Auditorium.

Some Characteristics of Cold Heading Wire

(*Continued from Page 720*)

Other Characteristics

AS will be noted, our comments have related to the more commonly recognized characteristics of cold-heading wire. However, there are several other factors, which in our opinion, have a very direct bearing on the performance of the stock, namely its aging and work-hardening capacity, the initial and final temperatures of upset, and speed of the upsetting operation. The information available regarding the relation of these factors to heading performance seems to be very meager. There have been cases where the wire after being held in stock for an extended period of time, has definitely shown less plastic flow in heading than when first received. On the other hand, some manufacturers purposely stock wire for definite periods, as their experience points to the aging as contributing some definite benefits to cold-heading.

✦ ✦ ✦

THE temperature of the stock as it is fed into the heading machine and the dissipation of heat during the upsetting operation undoubtedly affect the plastic flow of the metal. Some observations point to increased die life and greater plastic flow as results in initial wire temperatures of 100 to 200° F. It is even logical to assume that temperatures in a range somewhat above 600° F. might be used to advantage, considering, of course, that coatings must be developed to apply for such high temperature application. A greater knowledge of these and other heading phenomena might result in drastic changes for the future of the cold heading industry.

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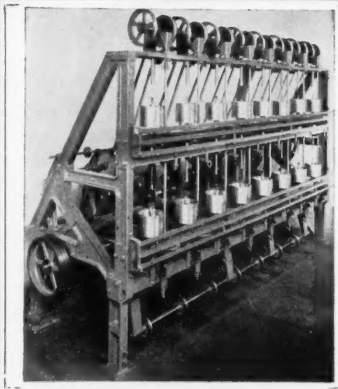

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(*Continued from Page 709*)

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RUSTLESS Iron and Steel Corporation was organized in 1924 as International Rustless Iron Corporation. It was then a patent holding company, but in 1926 organized its operating subsidiary, Rustless Iron Corporation of America. The former Hess Steel Company plant at Baltimore, which constitutes the nucleus of its present plant, was acquired the same year. The name Rustless Iron and Steel Corporation was adopted in 1933, at the time of a recapitalization which resulted in converting the corporation's mortgage debt into equity securities. Rustless Iron Corporation of America was dissolved in 1936, its assets being acquired and its liabilities assumed by Rustless Iron and Steel Corporation.

✦ ✦ ✦

EARLY activities of the corporation were devoted chiefly to improving its processes and developing its business. The present management took charge in 1931, and beginning with that year new manufacturing processes have been developed by Rustless employees which are covered by patents owned by the corporation.

✦ ✦ ✦

OFFICERS and directors are: **C. E. Tuttle,** president and chairman of the board; **T. F. McLaughlin,** vice-president in charge of operations; **J. K. Remsen,** secretary and treasurer; **G. B. Pumphrey,** comptroller and assistant treasurer. **W. B. Pierce** is sales manager.

✦ ✦ ✦

THE corporation employs processes covered by patents or applications for patents which its own experts have developed in recent years.

✦ ✦ ✦

EARNINGS of the corporation have progressively increased since the last quarter of 1934. Gross sales totaled $2,162,091 for the first half of 1937. This nearly equals sales for all of 1936, which totaled $2,646,783. Sales for 1935 were $1,675,494, and for 1934 were $819,161.

✦ ✦ ✦

CAPITAL and capital surplus total $2,363,172, with 848,027 shares of common and 25,000 shares of preferred stock which are owned by 8,500 stockholders. Assets are valued at $3,487,240. There is no funded indebtedness.

✦ ✦ ✦

Carboloy Buys 40 Acre Site For New Detroit Plant

PURCHASE of a 40 acre tract of land just outside the limits of Detroit has been announced by Carboloy Company, Inc., Detroit, Michigan,—manufacturers of Carboloy cemented carbides.

✦ ✦ ✦

IT is planned to build a factory on this site to manufacture cemented carbide tools, dies and wheel dressers. No details as to the size or nature of the structure are available as yet, as plans for the factory have not been completed.

✦ ✦ ✦

IN addition to its present factory in Detroit, Carboloy Company has a plant employing approximately 250 men at Stamford, Connecticut, and another manufacturing division in operation at the Cleveland, Ohio, Wire Works of the General Electric Company.

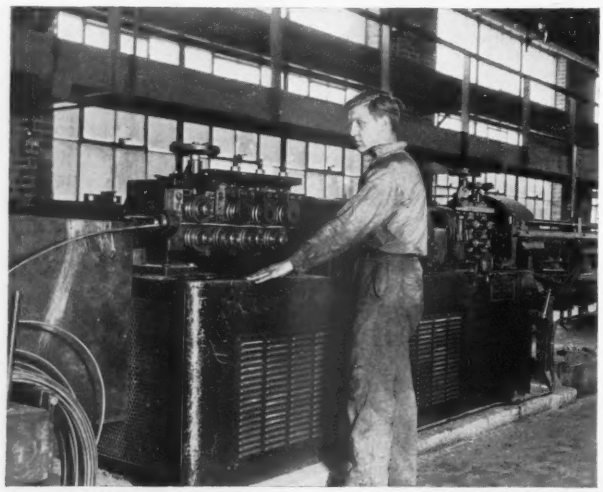

Fig. 8. Straightening and cutting machine.

✦ ✦ ✦

FOLDED PAPER FLATS
PAPER INSULATION YARNS
TWISTED "CELLOPHANE" YARNS
E. W. TWITCHELL, INC.
3rd & Somerset Sts. Phila., Pa.

ZINC STRIP AND WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

RUESCH
Machinery For
Wire, Tube, And Brass Mills
409 Mulberry St., Newark, N. J.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
11730 Harvard Ave.
CLEVELAND, OHIO

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16″ Frames, 8″ Frames — Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

SCHUMAG
CONTINUOUS ROD MAKING
STRAIGHTENING AND POLISHING MACHINES
W. A. SCHUYLER
FISK BLDG. NEW YORK

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. Col. 5-1340

HIGH SPEED
Welding Wire Straightening and Cutting Machinery
Round Wire Straightening and Cutting Machinery
Flat Wire Straightening and Cutting Machinery
Roll and Rotary Wire Straighteners
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

A Review of Recent Wire Patents

(*Continued from Page 729*)

More specifically, the invention provides an apparatus for placing fabric covers about coil springs, such as are employed in seat constructions and the like.

✦ ✦ ✦

No. 2,093,610, NAIL, Patented September 21, 1937, by Sebastian Kraemer, Los Angeles, California.

The inventor provides a wire nail having a coved fillet at the intersection of the head and shank which merges into a flat face on the underside of the head midway between the shank and the margin of the head. Disposed along the shank are a number of wedge-shaped corrugations which project towards the shank end of the nail.

✦ ✦ ✦

No. 2,093,680, METHOD OF AND APPARATUS FOR TREATING STRANDS, Patented September 21, 1937, by Leslie F. Lamplough, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

For the purpose of cleaning and otherwise conditioning of wire strands, the inventor has provided a pair of resilient rubber blocks having abrasive material embedded therein and having grooves in one of their faces. A floating intermediate block is provided of similar material and also having a groove. When pressure is applied to the intermediate block it is urged against the wire strand so that the strand is forced in the grooves of the fixed blocks.

✦ ✦ ✦

No. 2,094,024, APPARATUS FOR WINDING AND FORMING COILS, Patented September 28, 1937, by Julius Reichert, Astoria, N. Y.

This apparatus is adapted for simultaneously winding a number of wire coils and, when wound, to expand them.

✦ ✦ ✦

No. 2,094,500, JOINT FOR WIRE FABRICS, Patented September 28, 1937, by Otto Carl Scherfel, Haddon Heights, N. J., assignor to Audubon Wire Cloth Corporation, Philadelphia, Pa., a corporation of New Jersey.

Cross connector wires are provided for a joining means for wire belt fabrics made up of transversely arranged, helically coiled wires.

J. W. ROCKEFELLER, JR.
Consulting Spring Engineer
Investigations—Layouts—Costs
Spring Coiling
72 Washington St., New York City
Telephone: Bowling Green 9-2739

ROYLE
PATERSON N J
BUILDING EXTRUDERS SINCE 1880
Insulating Machinery for Western Electric Continuous Vulcanizing process.
JOHN ROYLE & SONS
PATERSON, N. J.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
Phone: Murray Hill 2-4188
Phone 5-6033

WILLIAM GOULD, M. E.
CONSULTING INDUSTRIAL ENGINEER
INVESTIGATIONS — LAYOUTS — COSTS
WIRE DRAWING & SPRING COILING
80 Van Cortlandt Park So., New York City

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

TUNGSTEN, DIAMOND, TANTALUM
DIES
KELLY
WIRE DIE CORPORATION
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Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

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Norton Co., Worcester, Mass.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANODES—Nickel
Seymour Mfg. Co., Seymour, Conn.

ANTI-RUST—
Magnus Chemical Co., Garwood, N. J.

ARMORING EQUIPMENT—
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
Seymour Mfg. Co., Seymour, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Lindberg Engineering Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CONTROLS—Automatic
Leeds & Northrup Co., Philadelphia, Pa.

CRANES—Block Stripping
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Cleaning House
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Electrical Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Wire Mill
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Co., New York, N. Y.
Detroit Wire Die Co., Detroit, Mich.
Driver Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

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DIES—Wire Drawing
Detroit Wire Die Co., Detroit, Mich.

DRAW BENCHES—
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENGINEERS—Consulting Wire Mill
Gould, William, New York, N. Y.
Lewis, Kenneth B., New York, N. Y.

ENGINEERS—Spring
Gould, William, New York, N. Y.
Rockefeller, J. W., Jr., New York, N. Y.

EQUIPMENT—Insulation Testing
Leeds & Northrup Co., Philadelphia, Pa.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACE CONTROLS — Combustion
Leeds & Northrup Co., Philadelphia, Pa.

FURNACE CONTROLS—Draft
Leeds & Northrup Co., Philadelphia. Pa.

FURNACES—Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.

FURNACES—Hardening and Tempering
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Normalizing
Leeds & Northrup Co., Philadelphia, Pa.

FURNACES—Wire, Strip & Sheet
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT — Material
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Electric Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.

INSTRUMENTS—Electrical
Leeds & Northrup Co., Philadelphia, Pa.

INSULATION — Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Warner Co., Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
R. H. Miller Co., Homer, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
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MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
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Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Elevator Supplies Co., Inc., Rahway, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

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Syncro Machine Co., Newark, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Enameling
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Royle, John & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis., and Providence, R. I.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Rahway, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
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Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

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Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
Amer. Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.

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H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY— Special — Combination Machine for Drawing, Cutting-to-length. Straightening and Reeling Bars from Coil in One Operation (Shumag Type)—
W. A. Schuyler, New York, N. Y.

MACHINERY—Spooling
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
Sleeper & Hartley Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Fall, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
Amer. Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Rahway, N. J.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Rahway, N. J.

MACHINERY—Wrapping Wire
Elevator Supplies Co., Inc., Rahway, N. J.
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

MONORAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

OVENS—Annealing or Drying
Lindberg Engineering Co., Chicago, Ill.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

POTS — Annealing, Case Hardening and Tempering
Lindberg Engineering Co., Chicago, Ill.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

PYROMETERS—
Leeds & Northrup Co., Philadelphia, Pa.

RECORDERS—
Leeds & Northrup Co., Philadelphia, Pa.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Stainless Steel
Rustless Iron & Steel Corp., Baltimore, Md.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
R. H. Miller Co., Homer, N. Y.

STAINLESS STEEL—
Rustless Iron & Steel Corp., Baltimore, Md.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Fall, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
Amer. Insulating Mach'y Co., Phila., Pa.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Seymour Mfg. Co., Seymour, Conn.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Stainless Steel
Rustless Iron & Steel Corp., Baltimore, Md.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

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ESTABLISHED 1845

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ENGINEERS - FOUNDERS - MACHINISTS

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This Unit Will Effect A Saving of Time and Labor of at Least Fifty Per Cent

Manufacturers and Warehouses should have a Crutch placed at each reel turning point: Power and Telephone Companies one on each truck. Wall Hook Fixture supplied with each unit.

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MORE CONVENIENT — These tubes are easy to adjust, install or to remove for maintenance—in fact, can be removed and replaced while the furnace is in operation.

INVESTIGATE — the economy, uniformity, convenience and other advantages of The Electric Furnace Co.'s new gas fired, recuperative type radiant tube for your next fuel fired furnace, installation or for modernizing your present furnace equipment.

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